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BACKGROUND DOCUMENT

RESEARCH TO MEET U.S. AND WORLD FOOD NEEDS

PART III

Research Needs

Working Conference on Research to Meet U.S. and World Food Needs

July 9-11, 1975  
Plaza Inn  
Kansas City, Missouri

**United States  
Department of  
Agriculture**

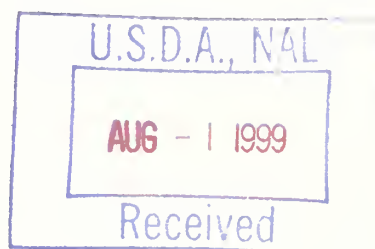


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RESEARCH TO MEET U.S. AND WORLD FOOD NEEDS

PART III

RESEARCH NEEDS





## RESEARCH TO MEET U.S. AND WORLD FOOD NEEDS

### PART III RESEARCH NEEDS

#### Introduction

The Research Needs in this document are provided as reference material for the delegates and others attending the Working Conference. They represent the more important problems which need to be solved by research as suggested and screened by more than 700 university, USDA and private research and extension personnel. They were finalized at a meeting of the Pre-Conference Review Group, consisting of 50 persons and including the chairmen and secretaries of the Conference Work Groups.

Delegates and others attending the Conference are urged to read the research needs for the areas of the Work Groups in which they will participate. In addition to indicating what problems research and extension persons consider important, these need statements may be helpful in formulating need statements to be presented at the Conference.

To the extent possible, delegates and other Conference participants should try to read the suggested needs for all areas. This information can contribute towards obtaining a perspective on the overall needs of food research.

# RESEARCH TO MEET U.S. AND WORLD FOOD NEEDS

## PART III RESEARCH NEEDS

### Outline of Background Documents

#### 1. Human Nutrition

- 1.1 Nutrient Requirements
- 1.2 Nutrient Composition
- 1.3 Food Consumption
- 1.4 Delivery Systems: Education
- 1.5 Delivery Systems: Non-Education and Food Programs

#### 2. Food Technology and Safety

- 2.1 Food Technology
- 2.2 Non-conventional Food Sources
- 2.3 Food Safety

#### 3. Natural Resources

- 3.1 Land
- 3.2 Water
- 3.3 Weather and Climate
- 3.4 Energy

#### 4. Cereals

- 4.1 Wheat
- 4.2 Rice
- 4.3 Corn
- 4.4 Grain Sorghum
- 4.5 Barley, Oats and Rye

#### 5. Oil Crops and Sugar

- 5.1 Soybeans
- 5.2 Cotton
- 5.3 Peanuts
- 5.4 Sunflower, Safflower and Other Oilseeds
- 5.5 Sugar



6. Vegetables, Potatoes, Dry Beans and Peas
  - 6.1 Vegetable Crops
  - 6.2 Potatoes
  - 6.3 Dry Beans and Peas
7. Fruits, Nuts and Bees
  - 7.1 Fruits and Nuts
  - 7.2 Bees and Other Pollinating Insects
8. Forage, Pasture and Range
  - 8.1 Harvested Forages and Seed Production
  - 8.2 Permanent, Rotation and Irrigated Pastures
  - 8.3 Range
9. Beef, Pork, Lamb and Mutton, and Other Animal Products
  - 9.1 Beef
  - 9.2 Pork
  - 9.3 Lamb and Mutton
  - 9.4 Other Animal Products
10. Dairy, Poultry and Aquatic Food Sources
  - 10.1 Dairy
  - 10.2 Poultry
  - 10.3 Aquatic Food Sources
11. Human Resources and Social Institutions
  - 11.1 Human Resources
  - 11.2 Social Institutions
12. Marketing Systems
13. Production Inputs and Systems
  - 13.1 Production Inputs and Services
  - 13.2 Production Systems
14. Public Policy and Finance
  - 14.1 Public Policy: Domestic
  - 14.2 Public Policy: International
  - 14.3 Finance

15. International Development

15.1 Food Production Technology and Resource Management

15.2 Food Quality and Distribution

15.3 Economic, Political and Institutional Aspects of Technology  
and Research

16. Basic Problems in Plant Growth and Reproduction

## 1.1 NUTRIENT REQUIREMENTS

### OBJECTIVE:

To insure adequate nutrition, resulting in optimal development and productivity of people.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Human Requirements

- 01.1.01 Determine the requirements for quantity and quality of protein, with particular emphasis on amino acid composition. \_\_\_\_\_
- 01.1.02 Determine the requirement for lipids to produce health and to prevent diseases associated with lipid balance. \_\_\_\_\_
- 01.1.03 Determine the requirements for type and quantity of carbohydrates, for health and to prevent diseases associated with imbalanced intake. \_\_\_\_\_
- 01.1.04 Determine the requirements for vitamins, for health and to prevent vitamin deficiency diseases. \_\_\_\_\_
- 01.1.05 Determine the amounts of minerals that humans require including trace elements such as copper, manganese, chromium, etc. \_\_\_\_\_
- 01.1.06 Identify differences in nutrient requirements according to age, sex, occupation, and during varying stress conditions. \_\_\_\_\_
- 01.1.07 Determine requirements for energy, and the effect of energy level on other nutrient requirements. \_\_\_\_\_

## 1.1 NUTRIENT REQUIREMENTS

(Continued)

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### Nutrient Deficiencies or Imbalances

- 01.1.08 Establish intake levels of energy, proteins, vitamins and minerals at which marginal deficiencies develop. \_\_\_\_\_
- 01.1.09 Establish the long-range effects of widespread marginal nutrient deficiencies on health, social well-being and productivity. \_\_\_\_\_
- 01.1.10 Determine the interrelationships of nutrients as consumed in foods, and the effects of imbalances. \_\_\_\_\_
- 01.1.11 Determine the levels at which excess nutrients become a critical problem. \_\_\_\_\_
- 01.1.12 Investigate health problems related to individual variations in the intake of foods, particular nutrients, and certain potentially harmful substances. \_\_\_\_\_

## 1.2 NUTRIENT COMPOSITION

### OBJECTIVE:

To provide accurate, up-to-date and comprehensive information about composition of important foods, the effects of processing on nutritional value, and the biological availability of nutrients.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Nutrients in Foods

- 01.2.01 Analyze the nutrients in raw foods, processed foods, and foods prepared for consumption. \_\_\_\_\_
- 01.2.02 Determine how much variance there is in nutrient content among samples, among varieties of foods, and in different areas. \_\_\_\_\_
- 01.2.03 Investigate the factors that affect nutrient content, and the amount of effect. \_\_\_\_\_
- 01.2.04 Measure the biological availability of nutrients in foods. \_\_\_\_\_
- 01.2.05 Investigate changes in nutrients from harvest through processing and distribution. \_\_\_\_\_
- 01.2.06 Develop prediction models for nutrient composition of foods under various systems of handling \_\_\_\_\_

### Information about Nutrients

- 01.2.07 Devise a system to channel scientific findings and analytical data from private and public laboratories into a central, computerized nutrient data bank in a form that can be readily retrieved and disseminated. \_\_\_\_\_
- 01.2.08 Develop data collection and retrieval methods that properly describe food materials, with simple methods for interpreting and analyzing data in various ways. \_\_\_\_\_

## 1.2 NUTRIENT COMPOSITION

(Continued)

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### Information about Nutrients (Continued)

- 01.2.09 Develop information systems for securing specific values for any item. \_\_\_\_\_
- 01.2.10 Investigate analytic techniques and variation in results among laboratories, including methods of identifying inaccurate values in order to permit comparison of results. \_\_\_\_\_
- 01.2.11 Develop representative nutrient values for foods; regularly publish current reference tables that are as representative as possible on a national scale, allowing for regional and seasonal differences in nutrient composition. \_\_\_\_\_
- 01.2.12 Develop references that include nutrient composition data from other areas of the world. \_\_\_\_\_
- 01.2.13 Devise reporting techniques that reflect the variability of published data on nutrient composition. \_\_\_\_\_

### Nutrient Analysis

- 01.2.14 Investigate the relationship between analytical values and biological availability. \_\_\_\_\_
- 01.2.15 Develop automated analysis of nutrients in foods. \_\_\_\_\_
- 01.2.16 Devise simpler methods for analyzing biologically important forms of nutrients in foods. \_\_\_\_\_

### 1.3 FOOD CONSUMPTION

#### OBJECTIVE:

Analyze trends and patterns in food expenditures, food consumption and nutrient intake, and their relationship to characteristics of individuals and/or households.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Measures of Food Consumption

- 01.3.01 Develop new techniques of assessing diets and of reporting the results. \_\_\_\_\_
- 01.3.02 Continuously monitor food consumption by a nationwide probability sample of households (individuals and families). \_\_\_\_\_
- 01.3.03 Continuously monitor food consumption by various groupings, such as single households, nuclear families, extended kin groups, social/business groups, nursing homes, day care centers, etc. \_\_\_\_\_
- 01.3.04 Estimate the variation in individual consumption of foods and nutrients over long periods of time. \_\_\_\_\_
- 01.3.05 Analyze the current U.S. food market for all major foods. \_\_\_\_\_
- 01.3.06 Project domestic demand for major food commodities under differing assumed conditions of price and government policy, including the effects of demand for one commodity on demand for others. \_\_\_\_\_

#### Reducing Waste

- 01.3.07 Provide information about the losses between production and consumption for various commodities. \_\_\_\_\_
- 01.3.08 Analyze factors related to food losses. \_\_\_\_\_



### 1.3 FOOD CONSUMPTION

(Continued)

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#### Reducing Waste (Continued)

- 01.3.09 Develop principles to reduce or eliminate waste in the food system. \_\_\_\_\_

#### Basic Research

- 01.3.10 Using representative samples, test alternative survey methods and combinations of methods. \_\_\_\_\_
- 01.3.11 Determine indicators of family socioeconomic status and social characteristics that are most relevant to food consumption. \_\_\_\_\_
- 01.3.12 Intermittently survey family and individual food consumption along with health status. \_\_\_\_\_
- 01.3.13 Develop and test models that interrelate (1) food patterns of households, (2) food and nutrient intake patterns of individuals within the household, and (3) socioeconomic and demographic characteristics. \_\_\_\_\_
- 01.3.14 Determine the differences between nutrient composition of food as purchased by households and nutrients actually eaten by individuals. \_\_\_\_\_



## 1.4 DELIVERY SYSTEMS--EDUCATION

### OBJECTIVE:

To improve the diets of all people to an adequate nutritional level.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Nutrition Education

- 01.4.01 Develop a daily food guide based on nutrient content and low cost. \_\_\_\_\_
- 01.4.02 Evaluate nutrition education programs that make use of the interdependence of groups--mothers and children, medical schools and patients, Federal food programs and children, etc. \_\_\_\_\_
- 01.4.03 Identify alternative ways of meeting nutrient needs of various family forms and cultural groups, and develop nutritional education programs for them. \_\_\_\_\_
- 01.4.04 Develop and evaluate alternative nutrition education programs. \_\_\_\_\_

### Food Intake Factors

- 01.4.05 Determine effects on eating patterns of income, housing, markets, mass media, cost, and availability of food. \_\_\_\_\_
- 01.4.06 Identify factors which can change eating behavior and acceptance of particular foods, including motivation, genetic and environmental factors. \_\_\_\_\_
- 01.4.07 Analyze the costs and benefits (social, psychological, biological, economic) of food consumption patterns used by various groups. \_\_\_\_\_

## 1.4 DELIVERY SYSTEMS--EDUCATION

(Continued)

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### Food Intake Factors (Continued)

01.4.08 Determine the effect on food consumption of changing employment patterns within families, including changing roles of women. \_\_\_\_\_

01.4.09 Determine behavioral changes that would be desirable for particularly vulnerable groups. \_\_\_\_\_

### Food Wastage Education

01.4.10 Develop ways of measuring food waste at the household level. \_\_\_\_\_

01.4.11 Identify causes and extent of food waste at the household level. \_\_\_\_\_

01.4.12 Investigate the relationship of life style, religious belief, etc. to the conservation ethic. \_\_\_\_\_

01.4.13 Develop and test education materials to reduce food waste. \_\_\_\_\_

## 1.5 DELIVERY SYSTEMS--NON-EDUCATION AND FOOD PROGRAMS

### OBJECTIVE:

To guarantee the availability of an adequate diet to all persons; or, if this is not feasible, to work toward a nutritional goal more realistic in relation to resources.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Policies, Programs and Standards

- 01.5.01 Develop a revised set of USDA food plans based on actual food patterns for use in consumer education and administration of food programs. \_\_\_\_\_
- 01.5.02 Evaluate the impact of USDA food policies and programs, as well as economic and demographic changes, on food consumption patterns of major U.S. population groups. \_\_\_\_\_
- 01.5.03 Assess food and nutrient needs of the U.S. and other countries as a basis for development of agricultural policy. \_\_\_\_\_
- 01.5.04 Re-evaluate the use of Recommended Dietary Allowances (RDA) as a base for setting standards for food delivery systems. \_\_\_\_\_
- 01.5.05 Develop alternative standards and evaluate their effectiveness. \_\_\_\_\_

### Nutritional Effects

- 01.5.06 Measure costs and benefits of adequate diets in terms of mental and physical health, employment and productivity, and capacity for change. \_\_\_\_\_
- 01.5.07 Develop data for setting priorities on nutrition problems, especially the problems of vulnerable groups. \_\_\_\_\_

1.5 DELIVERY SYSTEMS--NON-EDUCATION AND FOOD PROGRAMS

(Continued)

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Nutritional Effects (Continued)

- 01.5.08 Study the effects of diet on health, learning ability and work performance. \_\_\_\_\_
- 01.5.09 Identify foods to be emphasized in the delivery system based on their contribution to health and performance. \_\_\_\_\_
- 01.5.10 Develop models for use within educational systems and legislatures to predict the impact of nutrition on families and other social/political institutions. \_\_\_\_\_

Delivery Systems

- 01.5.11 Study efficiency of food delivery systems before they are initiated. \_\_\_\_\_
- 01.5.12 Evaluate efficiency of all food programs. \_\_\_\_\_
- 01.5.13 Analyze results and identify spin-offs of delivery systems and food programs. \_\_\_\_\_
- 01.5.14 Find ways to link nutrition education to food delivery systems. \_\_\_\_\_
- 01.5.15 Develop models to project the impact of delivery systems on the market and the economy, using Federal statistics on population, income, family composition, food supplies, food prices, etc. \_\_\_\_\_
- 01.5.16 To reduce costs within the system, develop new foods designed for cheap transport and easy storage. \_\_\_\_\_
- 01.5.17 Collect baseline data and monitor behavior of target groups in relation to food delivery systems. \_\_\_\_\_
- 01.5.18 Develop methods to motivate eligible persons to participate in food delivery programs. \_\_\_\_\_

## 2.1 FOOD TECHNOLOGY

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### OBJECTIVE:

To make available (assemble, improve, develop, process, preserve, protect and store) safe, wholesome, nutritious and high quality foods at reasonable cost.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Food Quality

- 02.1.01 Develop criteria for food quality standards in terms of nutrition, wholesomeness, and acceptability. \_\_\_\_\_
- 02.1.02 Develop instrumentation to measure quality factors simply and rapidly. \_\_\_\_\_
- 02.1.03 Determine environmental effects on food composition, nutritive value, and safety. \_\_\_\_\_
- 02.1.04 Determine how physical environmental factors (temperature, moisture, gasses, etc.) affect food quality. \_\_\_\_\_
- 02.1.05 Develop new technology to reduce costs and to deliver high quality products to consumers. \_\_\_\_\_

### New or Improved Foods

- 02.1.06 Determine the social and economic feasibility and nutritive possibilities of new or improved foods and processes. \_\_\_\_\_

### Storage and Handling in Homes and Elsewhere

- 02.1.07 Test consumer knowledge of food safety, storage and use; use this information to develop and test education materials. \_\_\_\_\_

## 2.1 FOOD TECHNOLOGY

(Continued)

Enter Rating  
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### Storage and Handling in Homes and Elsewhere (Continued)

- |         |   |       |
|---------|---|-------|
| 02.1.08 | Monitor effects of food handling practices in homes and institutions on (1) microbiological, toxic and other hazardous substances in foods and (2) nutritional value of foods.                        | _____ |
| 02.1.09 | Re-evaluate home preservation methods in light of microbiological safety, and of effects on palatability and nutrient retention.  | _____ |
| 02.1.10 | Evaluate storage conditions for perishable, non-perishable and convenience-type foods in terms of safety, palatability and nutrient retention.  | _____ |
| 02.1.11 | In group feeding programs (satellite feeding programs, meals-on-wheels, etc.) determine the effect of time, temperature and amount of food on microbiological safety, quality and nutrient retention. | _____ |
| 02.1.12 | Measure fuel and human energy expended in food preparation, including energy necessary for food storage.  | _____ |
| 02.1.13 | Establish guidelines for food preparation and service in homes, institutions and food service establishments.   | _____ |
| 02.1.14 | Develop methods to monitor handling of food during commercial processing, storage, transportation and marketing.  | _____ |
| 02.1.15 | Develop and improve packaging materials to prevent deterioration and damage during storage and transport.   | _____ |
| 02.1.16 | Develop a packaging system that will indicate mishandling in regard to temperature during storage.  | _____ |

### Water, Energy and Waste

- |         |   |       |
|---------|---|-------|
| 02.1.17 | Devise ways to remove foreign matter and toxic or harmful substances from processing water, so that it can be recycled. | _____ |
| 02.1.18 | Develop low-energy systems for processing, storage and distribution.  | _____ |

## 2.1 FOOD TECHNOLOGY

(Continued)

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### Water, Energy and Waste (Continued)

- 02.1.19 Develop a model for evaluating waste generation from food source to consumer. \_\_\_\_\_
- 02.1.20 Develop methods and equipment to collect, treat and dispose of food wastes; or to use them for food, feed or byproducts. \_\_\_\_\_





## 2.2 NON-CONVENTIONAL FOOD SOURCES

### OBJECTIVE:

To develop non-conventional foods which will add to the human food supply and meet requirements for nutritional value, safety, consumer preference, and cost.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Soy and Cereal Protein

- 02.2.01 Determine the least-cost method of producing soy products with good flavor and functional properties for a particular use. \_\_\_\_\_
- 02.2.02 Eliminate the off-flavor of soy-based products. \_\_\_\_\_
- 02.2.03 Determine the potential for blending soy proteins with other plant proteins. \_\_\_\_\_
- 02.2.04 Develop corn germ protein isolate with required qualities--texture, flavor interaction with other foods, fiber composition, etc. \_\_\_\_\_
- 02.2.05 Evaluate and improve grain sorghum as a protein source. \_\_\_\_\_

### Plant Juices or Leaf Proteins

- 02.2.06 Develop an economic method to prevent off-color when leaf protein is incorporated into foods (action of chlorogenic acid). \_\_\_\_\_
- 02.2.07 Develop ways to use the liquid "whey" produced during preparation of leaf protein. \_\_\_\_\_
- 02.2.08 Search for sources of leaf proteins in plants native to Asia, South America and India. \_\_\_\_\_
- 02.2.09 Develop machines and systems to harvest fresh plants, extract the juices and preserve high-quality protein. \_\_\_\_\_

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## 2.2 NON-CONVENTIONAL FOOD SOURCES

(Continued)

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### Plant Juices or Leaf Proteins (Continued)

- 02.2.10 Evaluate the economics of leaf protein extraction and disposal of the residue, compared to the use of leaves as cattle feed.

### Single-cell Proteins

- 02.2.11 Develop methods to use the vast amounts of yeast-grain protein produced by distilleries and breweries.
- 02.2.12 Develop methods of using enzymes to treat yeast cell walls.
- 02.2.13 Evaluate methods for using single-cell proteins in foods without removing all cell walls.

### Seafood Byproducts

- 02.2.14 Improve processes for separating usable proteins from fish and fish meal processing wastes.
- 02.2.15 Compare potential seafood byproducts with alternative food sources, including such factors as availability of raw materials, feasibility of central processing, and economic potential of the product.

### Processing Wastes

- 02.2.16 Develop ways to use leafy processing wastes as possible protein and fiber sources.
- 02.2.17 Develop animal processing byproducts as protein resources, particularly edible grade blood.

### Basic Research Needs

- 02.2.18 Improve ways of analyzing quantity and quality of food proteins.
- 02.2.19 Develop ways to evaluate potential food protein sources in light of consumer needs in particular regions, processing requirements, and economics.
- 02.2.20 Determine the chemical, physical and structural qualities of various proteins that affect their function in food systems.

## 2.3 FOOD SAFETY

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### OBJECTIVE:

To provide safe, wholesome and nutritious food that can be consumed by people in all countries.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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	<u>Enter Rating Here</u>
<u>Natural Toxicants</u>	
02.3.01 Discover potential problem materials.	_____
02.3.02 Investigate the potential for harm of natural toxicants.	_____
02.3.03 Determine methods to avoid natural toxicants.	_____
02.3.04 Determine methods of handling when present--removal, detoxification, dilution, etc.	_____
02.3.05 Investigate ways to educate consumers to accept alternate foods if necessary and possible.	_____
<u>Contaminants</u>	
02.3.06 Discover potential problem materials.	_____
02.3.07 Determine the potential for harm of contaminants.	_____
02.3.08 Determine ways to avoid contamination, including new equipment, methods and varieties.	_____
02.3.09 Determine methods of handling contaminants when present--removal, detoxification, dilution, etc.	_____
02.3.10 Investigate ways to educate consumers to accept alternate foods if necessary and possible.	_____

## 2.3 FOOD SAFETY

(Continued)

Enter Rating  
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### Contaminants (Continued)

02.3.11 Develop methods to control desirable and undesirable changes in foods resulting from enzymes, protein reactions, chemical interaction, etc. \_\_\_\_\_

02.3.12 Develop quick methods to detect contaminants in foods. \_\_\_\_\_

### Chemical Residues

02.3.13 Study factors affecting the levels of residues in foods. \_\_\_\_\_

02.3.14 Evaluate the levels of chemical residues acceptable from the public health viewpoint. \_\_\_\_\_

02.3.15 Develop food processing methods that minimize the levels of harmful residues in foods. \_\_\_\_\_

02.3.16 Develop more knowledge of the usefulness and safety of food additives. \_\_\_\_\_

### 3.1 LAND

#### OBJECTIVE:

To efficiently make use of land resources and to optimize the productivity of agricultural land consistent with human needs and the requirements of conservation, environmental quality and long-term use.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Resource Appraisal

- 03.1.01 Identify characteristics of soils and associated resources in farmland areas, in order to help establish land use priorities and soil conservation practices. \_\_\_\_\_
- 03.1.02 Develop a detailed classification system based on land capability, to serve as a basis for land resource management policies. \_\_\_\_\_
- 03.1.03 Determine the relationship between soil productivity and per-unit cost of production for major crops in various regions. \_\_\_\_\_
- 03.1.04 Develop computer systems to store, interpret and retrieve data on soil and climate in different areas. \_\_\_\_\_
- 03.1.05 Determine the feasibility and the trade-offs involved in using productive agricultural land for multiple or alternate uses. \_\_\_\_\_
- 03.1.06 Develop methods to use land inventory information in designing land management policies which take land characteristics into account. \_\_\_\_\_

#### Land Management and Fertility

- 03.1.07 Develop better reduced-tillage practices for a wide range of soil, climate and crop conditions. \_\_\_\_\_
- 03.1.08 Develop better ways to improve infiltration and storage of water in soils. \_\_\_\_\_

### 3.1 LAND

(continued)

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#### Land Management and Fertility (continued)

- 03.1.09 On different types of range land, determine the best stocking rates for different kinds of animals, including wild animals. \_\_\_\_\_
- 03.1.10 Determine the best methods to manage vegetation and to manage or control pests and predators for improved production of forage and livestock. \_\_\_\_\_
- 03.1.11 Incorporate into other food and forage crops the ability to symbiotically fix nitrogen. \_\_\_\_\_
- 03.1.12 Develop ways to better control rates at which plant nutrients become available or unavailable in the soil. \_\_\_\_\_

#### New Lands

- 03.1.13 Develop models of potentially arable lands that can be used to evaluate proposed development programs in terms of expected production, required inputs, and economic and social policies. \_\_\_\_\_
- 03.1.14 Determine required inputs (irrigation, fertilization, drainage, clearing, etc.) to convert potentially arable lands to various agricultural uses. \_\_\_\_\_
- 03.1.15 Make an inventory of potential new arable land areas, report on their soil, climate and physical conditions, and determine their potential for various food crops. \_\_\_\_\_

#### Erosion and Pollution

- 03.1.16 Determine adverse effects of heavy metals and other constituents in sewage sludge when it is applied to soils; develop methods to minimize crop uptake. \_\_\_\_\_
- 03.1.17 Develop tillage and planting systems emphasizing energy conservation and control of soil erosion. \_\_\_\_\_
- 03.1.18 Evaluate the impact of wind and water erosion on long-term soil productivity and crop yields, in relation to environmental quality. \_\_\_\_\_
- 03.1.19 Determine costs and benefits of different systems of applying farm manures to land, in order to minimize pollution and reduce need for purchased fertilizers. \_\_\_\_\_
- 03.1.20 Determine the suitability of using waste effluents to provide nutrients and water for crop production. \_\_\_\_\_



### 3.2 WATER

#### OBJECTIVE:

To develop, conserve and efficiently utilize present and potential water supplies for food production with due consideration for other uses and environmental quality.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Resource Appraisal

Enter Rating  
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- 03.2.01 Develop more intensive measurements of surface and ground water quality. \_\_\_\_\_
- 03.2.02 Investigate the possibilities of recycling urban waste-water, including its quantity, quality and economic potential for re-use in agriculture. \_\_\_\_\_
- 03.2.03 Determine the best use of Federal funds for soil and water conservation activities which will give the most economical increase in food production. \_\_\_\_\_
- 03.2.04 Study the competition between a growing population and agricultural use of water to provide planning information for best use of water. \_\_\_\_\_
- 03.2.05 Evaluate the contribution of alternate uses of water to society's goals, and the best levels of investment and allocation among different uses. \_\_\_\_\_
- 03.2.06 Determine the impact of power development on availability of water for farm production. \_\_\_\_\_

#### Quality of Water

- 03.2.07 Develop methods to rapidly identify and evaluate water pollutants and their sources, and ways to renew water quality. \_\_\_\_\_
- 03.2.08 Improve soil and water management to control erosion and sedimentation. \_\_\_\_\_
- 03.2.09 Develop methods for recycling irrigation water and maintaining the quality of surface streams and groundwater. \_\_\_\_\_

## 3.2 WATER

(continued)

<u>Quality of Water (continued)</u>	<u>Enter Rating Here</u>
03.2.10 On both irrigated and non-irrigated lands, develop ways to minimize or eliminate the nutrient enrichment of surface and subsurface water.	_____
03.2.11 Determine impacts of Federal and State water quality legislation and administration on water development and food production.	_____
<u>Conservation and Use</u>	
03.2.12 Determine timing and amounts of crop irrigation to make more efficient use of water consistent with economic constraints.	_____
03.2.13 Find ways to improve water use efficiency on non-irrigated lands.	_____
03.2.14 Find ways to improve irrigation water storage and distribution systems in order to increase water use efficiency and control water quality.	_____
03.2.15 Determine more closely the effects of water on crop production.	_____
03.2.16 Investigate methods of capturing and retaining precipitation in arid and semi-arid regions.	_____
03.2.17 Develop more accurate measurements of plant-soil moisture relationships.	_____
<u>Legal and Institutional Considerations</u>	
03.2.18 Examine the potential benefits and constraints of consolidating flood control, drainage, and irrigation districts.	_____
03.2.19 Determine the most efficient combination of water laws, water rights and market mechanisms to develop, conserve and efficiently utilize water supplies.	_____
03.2.20 Evaluate market and non-market mechanisms for increasing the efficiency of water use.	_____



### 3.3 WEATHER AND CLIMATE

#### OBJECTIVE:

To achieve understanding of weather and climate and related agricultural production in order to (1) develop policy decisions on farm production and food supplies, (2) preserve environmental quality and resources needed for food production, (3) ameliorate effects of adverse weather and (4) plan future plant and animal research.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Resource Appraisal

Enter Rating  
Here

- 03.3.01 Measure the responses of animals and crops to weather, using simultaneously recorded biological and environmental data. \_\_\_\_\_
- 03.3.02 Survey soil moisture and plant water deficits in farm areas where soil moisture reserves may limit farm production. \_\_\_\_\_
- 03.3.03 Study crop, weather and soil patterns over wide geographical areas to determine whether variety tests and other research data can be used in various parts of the area. \_\_\_\_\_
- 03.3.04 Determine present and future needs for data on climate; develop techniques and instruments to collect it, summarize it, and make it available for agricultural forecasts. \_\_\_\_\_
- 03.3.05 Develop a network to measure net radiation, soil moisture, soil temperatures, humidity, ultraviolet radiation and wind, and report their implications for agriculture (transport of insects and diseases, etc.) \_\_\_\_\_

#### Climatic Stress

- 03.3.06 Develop methods that overcome or reduce weather stress (irrigation, windbreaks, intercropping, animal shelters, etc.) \_\_\_\_\_
- 03.3.07 Breed plant varieties and animals with stress resistance. \_\_\_\_\_

### 3.3 WEATHER AND CLIMATE

(continued)

Enter Rating  
Here

#### Climatic Stress (continued)

03.3.08 Evaluate plant canopy design (canopy modeling) as a way to improve crop use of carbon dioxide and solar energy.

03.3.09 Identify important characteristics that confer resistance to weather stress.

#### Micro-Climate Modification

03.3.10 Investigate the roles of radiation, heat, water, carbon dioxide and chemicals at (1) the soil surface, (2) within plant canopies and (3) at the upper surface of the plant canopy.

13.3.11 Develop models to predict effects on plant and soil micro-climates of (1) inadvertent and deliberate changes in the weather or climate and (2) management inputs such as tillage and disposal of plant residues.

03.3.12 Extend the technique of plant canopy modeling to more complex systems such as row crops and inter-crop systems.

03.3.13 Develop cultural methods such as vegetative mulches and windbreaks to change micro-climates and reduce plant stress.

03.3.14 Investigate control of evapotranspiration to increase the available plant water supply.

03.3.15 Develop more knowledge to predict wilting, disease and insect outbreaks caused by weather.

03.3.16 Use weather-soil-plant productivity concepts to estimate plant performance under changed climatic conditions.

#### Weather and Climate

03.3.17 Learn more about climate and weather changes caused intentionally or unintentionally by man--such as urban climates, particulates in the atmosphere, etc.

### 3.3 WEATHER AND CLIMATE

(continued)

Enter Rating  
Here

#### Weather and Climate (continued)

- 03.3.18 Determine the probabilities over time of unfavorable weather in each of the major producing and importing regions of the world; and the probabilities of simultaneous unfavorable weather in a number of regions within a given year or in consecutive years. \_\_\_\_\_
- 03.3.19 Determine the probabilities of short and long-range changes in climate for major areas of arable land. \_\_\_\_\_
- 03.3.20 Identify agricultural production practices based on favorable weather during the last decade or two, and identify the changes that may be needed to adjust agriculture to a more variable, less favorable climatic period. \_\_\_\_\_



### 3.4 ENERGY

#### OBJECTIVE:

To assure an economic and adequate supply of food by increasing the efficiency of energy utilization and developing substitutes for oil and mineral fertilizers in the production, marketing, processing and utilization of foods.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
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#### Increasing Efficiency of Energy Use

(These research needs are presented in other sections.)

#### Alternatives and Substitutes

- |         |  |       |
|---------|--|-------|
| 03.4.01 | Develop and improve uses of solar energy for heat and power.   | _____ |
| 03.4.02 | Develop and improve uses of wind for power.  | _____ |
| 03.4.03 | Increase use of agricultural wastes as power and heat sources.   | _____ |
| 03.4.04 | Increase use of coal in providing food supplies.   | _____ |
| 03.4.05 | Increase use of renewable organic fertilizers and nitrogen fixation.   | _____ |
| 03.4.06 | Investigate the possibility of reducing energy requirements by optimizing the geographic structure of agriculture.   | _____ |
| 03.4.07 | Obtain more data on the energy used by the food production, marketing and consumption system, in order to suggest improvements, assess the impact of national policies, determine the effects of alternative practices, and establish research priorities. | _____ |
| 03.4.08 | Investigate the use of heat from power generators especially stationary electricity generation plants.   | _____ |

### 3.4 ENERGY

(continued)

Enter Rating  
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#### Alternatives and Substitutes (continued)

- |         |   |       |
|---------|---|-------|
| 03.4.09 | Evaluate the impact on food supplies of an energy tax or energy allocation systems.   | _____ |
| 03.4.10 | Develop cheaper means of storing energy, particularly from sources with varying output and for uses with varying requirements.    | _____ |
| 03.4.11 | Develop multi-commodity systems to make more efficient use of energy.   | _____ |
| 03.4.12 | Develop uses of nuclear energy for food production, processing, transport and storage.  | _____ |
| 03.4.13 | Increase heat storage efficiency and capacity to use waste heat.  | _____ |
| 03.4.14 | Determine equipment performance requirements for energy conversion, in order to provide satisfactory components for food systems. | _____ |
| 03.4.15 | Develop low-energy culture systems for food production.   | _____ |

## 4.1 WHEAT

### OBJECTIVE:

To develop production, management, marketing, and utilization practices to assure an adequate supply of wheat for US needs and a stable supply for export markets, while conserving resources and environmental quality; and to improve nutritional and processing quality.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Production

- 04.1.01 Minimize genetic vulnerability of wheat to environmental stress, insects, diseases, nematodes and weeds. \_\_\_\_\_
- 04.1.02 Collect and maintain a stockpile of wheat germ plasm so that new genetic combinations can be made. \_\_\_\_\_
- 04.1.03 Produce wheats better adapted to growing conditions particularly via improved winter-hardiness, drought tolerance and seedling vigor. \_\_\_\_\_
- 04.1.04 Develop genetic resistance to major diseases, nematodes and insects. \_\_\_\_\_
- 04.1.05 Investigate the nature of winter-hardiness in wheat. \_\_\_\_\_
- 04.1.06 Explore the possibility of developing nitrogen-fixing capacity in wheat. \_\_\_\_\_
- 04.1.07 Improve the photosynthetic capability and efficiency of wheat plants, in order to increase use of solar energy and improve yields and quality. \_\_\_\_\_

### Processing and Marketing

- 04.1.08 Update grain standards and revise grain sanitation procedures. \_\_\_\_\_
- 04.1.09 Improve transportation systems for moving wheat from the farm to terminal elevators. \_\_\_\_\_





#### 4.1 WHEAT

(Continued)

Enter Rating  
Here

##### Processing and Marketing (Continued)

- |         |   |       |
|---------|---|-------|
| 04.1.10 | Evaluate possible new freight rate structures that would not unduly increase marketing costs.                   | _____ |
| 04.1.11 | Determine the impact of US marketing policies on the competitive position of American wheat in foreign markets. | _____ |
| 04.1.12 | Determine wheat uses and requirements of foreign customers.   | _____ |
| 04.1.13 | Develop a more efficient information system on export sales.  | _____ |
| 04.1.14 | Develop methods of promoting export sales.  | _____ |

##### Consumer Needs

- |         |   |       |
|---------|---|-------|
| 04.1.15 | Continue and expand efforts to increase protein quantity and quality. | _____ |
|---------|---|-------|

##### Basic Research

- |         |   |       |
|---------|---|-------|
| 04.1.16 | Develop additional methods for crop improvement, including protoplast hybridization.            | _____ |
| 04.1.17 | Expand research on intergeneric hybrids, including cell genetics and tissue culture techniques. | _____ |
| 04.1.18 | Investigate host-pest interactions and plant resistance to pests and environmental stress.      | _____ |
| 04.1.19 | Investigate the nature of drought resistance.   | _____ |
| 04.1.20 | Develop tests to rapidly screen germ plasm collections for genetic variations in grain.         | _____ |



## 4.2 RICE

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### OBJECTIVE:

To develop production, marketing and utilization practices that will assure adequate supplies of rice for domestic and foreign markets that now exist or can be developed, while minimizing loss of resources and environmental quality.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Production

- 04.2.01 Breed new high-production, high-quality varieties that tolerate such hazards as diseases, insects and cool temperatures. \_\_\_\_\_
- 04.2.02 Develop improved screening techniques for locating sources of resistance to major rice diseases, including stem rot and other stem diseases. \_\_\_\_\_
- 04.2.03 Develop adapted commercial rice varieties with a broader genetic base to increase resistance to major production hazards. \_\_\_\_\_
- 04.2.04 Determine more fully the mutual effects of rice diseases, fertilization, and other cultural practices. \_\_\_\_\_
- 04.2.05 Develop improved pesticides and equipment for applying them in order to minimize potential damage to adjacent crops and the environment. \_\_\_\_\_
- 04.2.06 Develop new, nonchemical approaches to control of rice weeds, insects and diseases. \_\_\_\_\_
- 04.2.07 Develop methods for reducing nitrogen losses and increasing nitrogen utilization by the plant. \_\_\_\_\_
- 04.2.08 Develop improved varieties of all three major grain types with shorter growing periods, in order to facilitate double cropping and increase output. \_\_\_\_\_

## 4.2 RICE

(Continued)

Enter Rating  
Here

### Production (Continued)

- 04.2.09 Investigate effects of adverse microclimate and find ways to reduce its damage, such as floret sterility. \_\_\_\_\_
- 04.2.10 Develop improved tillage equipment and methods to (1) reduce energy use and costs and (2) dispose of crop residues with minimum harm to the environment. \_\_\_\_\_
- 04.2.11 Develop improved methods of selecting potential yield and resistance-increasing factors. \_\_\_\_\_
- 04.2.12 Develop ways to reduce the amount of water needed to produce rice, including suitable varieties with shorter growing periods. \_\_\_\_\_

### Processing and Marketing

- 04.2.13 Develop ways to increase rice milling yields. \_\_\_\_\_
- 04.2.14 Improve rice storage methods to prevent damage from insects and microorganisms. \_\_\_\_\_
- 04.2.15 Investigate ways to increase the market for lower cost, non-premium, high-yielding varieties of short grain rice. \_\_\_\_\_
- 04.2.16 Develop alternative ways of carrying US rice stocks from years of world-plenty to years of shortage. \_\_\_\_\_

### Consumer Needs

- 04.2.17 Develop varieties with a higher protein content. \_\_\_\_\_

### Basic Research

- 04.2.18 Study the genetic, physiologic and morphologic factors that determine grain yield. \_\_\_\_\_
- 04.2.19 Study the root growth of rice plants and the chemistry of flooded soils, in order to improve soil conditions for growth and yield. \_\_\_\_\_
- 04.2.20 Improve efficiency of solar energy conversion in rice. \_\_\_\_\_

### 4.3 CORN

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#### OBJECTIVE:

To develop production, marketing and utilization practices to assure an adequate supply of corn for US livestock needs and for human food at home and abroad, while conserving resources and environmental quality.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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	<u>Enter Rating Here</u>
<u>Production</u>	
04.3.01 Increase the genetic diversity of corn in order to lower its vulnerability to pests and diseases.	_____
04.3.02 Increase genetic resistance to diseases and pests.	_____
04.3.03 Breed corn with improved efficiency in using resources such as nitrogen and other soil nutrients, moisture and sunlight.	_____
04.3.04 Develop improved breeding systems by such means as integrating exotic germ plasm and methods of plant population improvement.	_____
04.3.05 Develop more effective ways to measure and select for yield responses.	_____
04.3.06 Determine the most effective and productive cultural practices, and the plant types required to give top production under the best conditions.	_____
04.3.07 Improve photosynthetic capability and efficiency.	_____
04.3.08 Develop nitrogen fixation capability.	_____
04.3.09 Develop biological, ecological, mechanical, chemical and integrated systems of weed control.	_____
04.3.10 Increase tolerance to cold.	_____
04.3.11 Improve seed vigor, viability and resistance to deterioration in storage.	_____

## 4.3 CORN

(Continued)

Enter Rating  
Here

### Storage, Processing, Marketing

- 04.3.12 Improve handling, drying and storage techniques to conserve energy and to reduce losses of grain and silage, with special attention to mycotoxins. \_\_\_\_\_
- 04.3.13 Evaluate potential reorganization of the transportation system, considering location of grain storage facilities, costs of transportation, and general costs and benefits. \_\_\_\_\_
- 04.3.14 Investigate alternative approaches to grain drying, such as solar heat, low temperature drying, early maturing varieties and field drying. \_\_\_\_\_
- 04.3.15 Develop foreign markets for corn. \_\_\_\_\_

### Consumer Needs and the Environment

- 04.3.16 Improve the chemical composition of corn in order to better meet human nutritional requirements. \_\_\_\_\_
- 04.3.17 Develop better systems of pest control which minimize the hazards of pesticides. \_\_\_\_\_
- 04.3.18 Develop and evaluate tillage systems for corn that use residues or other treatment of the soil surface to control runoff and erosion. \_\_\_\_\_

### Basic Research

- 04.3.19 Investigate the genetic and physiological processes affecting nutrient uptake and use. \_\_\_\_\_
- 04.3.20 Develop intergeneric crosses. \_\_\_\_\_

#### 4.4 GRAIN SORGHUM

##### OBJECTIVE:

To develop production, marketing and utilization practices to assure an adequate supply of sorghum grain and forage for livestock and poultry needs and a grain supply for industrial and food used in the US and in less developed countries, while minimizing loss of resources and environmental quality.

##### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

<u>Production</u>	<u>Enter Rating Here</u>
04.4.01 Improve the photosynthetic capability and efficiency of sorghum.	_____
04.4.02 Improve efficiency of water use and drought tolerance.	_____
04.4.03 Reduce fertilization requirements, screen types of sorghum to locate differences in nutrient absorption from varying soils.	_____
04.4.04 Investigate soil and crop management systems and other techniques such as soil covers and anti-transpirants, to increase efficiency of water use.	_____
04.4.05 Develop high-yielding hybrids best suited for livestock feeding.	_____
04.4.06 Collect, evaluate, and maintain sorghum germ plasm from throughout the world.	_____
04.4.07 Develop new sorghum types with a broader genetic base.	_____
<u>Crop Protection</u>	
04.4.08 Develop standby breeding stocks to minimize genetic vulnerability.	_____
04.4.09 Develop pest management systems for grain sorghum.	_____
04.4.10 Develop plant resistance to insects such as sorghum greenbug, sorghum midge and Bank's grass mite.	_____

#### 4.4 GRAIN SORGHUM

(Continued)

Enter Rating  
Here

##### Crop Protection (Continued)

04.4.11 Develop resistance to such diseases as maize dwarf  
mosaic virus and downy mildew. \_\_\_\_\_

04.4.12 Develop weed control systems. \_\_\_\_\_

##### Storing and Marketing

04.4.13 Develop more energy-efficient systems of drying grain. \_\_\_\_\_

04.4.14 Develop export markets. \_\_\_\_\_

##### Consumer Needs

04.4.15 Continue development of high protein, balanced amino  
acid types of sorghum. \_\_\_\_\_

##### Basic Research

04.4.16 Develop alternate sterility systems for producing  
hybrids. \_\_\_\_\_

04.4.17 Study aspects of water use related to (1) water loss  
through evapotranspiration and (2) metabolic  
efficiency. \_\_\_\_\_

04.4.18 Develop new sterility systems to reduce vulnerability  
to biological hazards. \_\_\_\_\_

04.4.19 Determine the nature of host-pest interactions and  
resistance to pests and environmental stress. \_\_\_\_\_

04.4.20 Identify variables involved in digestibility of  
forages. \_\_\_\_\_



#### 4.5 BARLEY, OATS AND RYE

##### OBJECTIVE:

To develop production, marketing and utilization systems to assure adequate supplies of barley, oats and other small grains for US livestock needs, industrial uses, and to meet export demands, while minimizing loss of resources and environmental quality.

##### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

		Enter Rating Here
<u>Production</u>		
04.5.01	Re-shape plants to make better use of sunlight and to increase the ratio of economic to biological yield.	_____
04.5.02	Improve photosynthetic capability and efficiency.	_____
04.5.03	Explore the possibility of developing nitrogen fixing systems.	_____
04.5.04	Breed plants that can take more of a particular mineral from the soil and use it more efficiently.	_____
04.5.05	Improve lodging resistance in barley and oats.	_____
04.5.06	Develop varieties that perform well with limited moisture.	_____
04.5.07	Develop methods of minimum tillage and no-tillage, and compare them with conventional methods.	_____
04.5.08	Develop double cropping practices.	_____
04.5.09	Breed winter oat and winter barley varieties with early maturity and increased winter hardiness for double cropping in northern areas.	_____
<u>Crop Protection</u>		
04.5.10	Develop broader genetic resistance to pests, to avoid losses when resistance to a particular pest race becomes ineffective.	_____

#### 4.5 BARLEY, OATS AND R

(Continued)

Enter Rating  
Here

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##### Crop Protection (Continued)

- 04.5.11 Develop more tolerance or resistance to pesticides, particularly herbicides, in order to make more use of selective chemicals. \_\_\_\_\_
- 04.5.12 Increase tolerance to environmental stress such as drought, high temperatures and winter killing. \_\_\_\_\_
- 04.5.13 Develop new, genetically diverse, multipest resistant varieties. \_\_\_\_\_
- 04.5.14 Continue to search for measures to control the cereal leaf beetle. \_\_\_\_\_
- 04.5.15 Develop integrated systems of weed control that reduce energy use. \_\_\_\_\_

##### Consumer Needs

- 04.5.16 Develop oat varieties with improved protein quantity and improved amino acid balance. \_\_\_\_\_
- 04.5.17 Increase use of byproducts from barley used in malting and brewing. \_\_\_\_\_
- 04.5.18 Increase digestible energy of oats. \_\_\_\_\_
- 04.5.19 Improve feed grain quality of barley. \_\_\_\_\_

## 5.1 SOYBEANS

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### OBJECTIVE:

To provide an adequate supply of vegetable protein and oil to meet domestic and world needs, and to make optimum use of production and marketing resources.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Production

Enter Rating  
Here

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- 05.1.01 Develop systems and practices to maximize yields and minimize tillage. \_\_\_\_\_
- 05.1.02 Develop herbicides and methods of application for hard-to-control weeds. \_\_\_\_\_
- 05.1.03 Broaden the germ plasm base by exploration in Asia and by using existing collections. \_\_\_\_\_
- 05.1.04 Identify the plant characteristics that limit seed yield and production of oil and protein under different crop conditions. \_\_\_\_\_
- 05.1.05 Develop high yielding varieties for different production and pest conditions, including root and stem rot diseases and photoperiod insensitivity. \_\_\_\_\_
- 05.1.06 Identify more effective strains of rhizobia and develop techniques for inoculating the soil with them. \_\_\_\_\_
- 05.1.07 Determine the best combinations of tillage and harvesting operations for single and double-crop systems. \_\_\_\_\_
- 05.1.08 Evaluate soybean harvesting systems and equipment to reduce field and handling losses. \_\_\_\_\_

### Processing and Marketing

- 05.1.09 Develop means of eliminating the "beany" flavor of full fat and defatted soy flour. \_\_\_\_\_

## 5.1 SOYBEANS

(Continued)

Enter Rating  
Here

### Processing and Marketing (continued)

05.1.10 Improve rail transportation or develop substitutes. \_\_\_\_\_

05.1.11 Evaluate market development opportunities. \_\_\_\_\_

05.1.12 Develop methods for increasing export markets. \_\_\_\_\_

### Consumer Needs

05.1.13 Increase acceptability of soy protein products as human food. \_\_\_\_\_

05.1.14 Develop varieties that have little or no flatulence factor or trypsin inhibitors. \_\_\_\_\_

### Basic Research

05.1.15 Increase knowledge of soybean genetics through cell genetics and other studies of the cell. \_\_\_\_\_

05.1.16 Increase understanding of soybean nutrition and related rooting patterns. \_\_\_\_\_

05.1.17 Study nitrogen metabolism, including fixation systems. \_\_\_\_\_

05.1.18 Study the physiology of reproduction, including the hormones that control distribution of materials between vegetative and reproductive sites. \_\_\_\_\_

05.1.19 Determine the factors that offer substantial promise in breaking yield barriers. \_\_\_\_\_

05.1.20 Develop technology to maximize seedling vigor and viability, and to reduce deterioration in storage. \_\_\_\_\_

## 5.2 COTTONSEED

---

### OBJECTIVE:

To provide an adequate supply of cottonseed protein and oil to meet domestic and world needs with minimal adverse environmental impact.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Production

Enter Rating  
Here

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- 05.2.01 Develop high yielding, glandless varieties with multiple pest resistance. \_\_\_\_\_
- 05.2.02 Look for useful genetic variations in total protein, amino acid content and oils. \_\_\_\_\_
- 05.2.03 Study desirable oil and protein characteristics, and incorporate them into breeding stock and commercial varieties. \_\_\_\_\_
- 05.2.04 Look for genetic disease and pest resistance factors. \_\_\_\_\_
- 05.2.05 Determine inheritance patterns of pest resistance. \_\_\_\_\_
- 05.2.06 Develop improved pest management systems and production practices. \_\_\_\_\_
- 05.2.07 Develop superior glandless varieties, stressing pest resistance, adaptability, extreme early maturity and natural defoliation. \_\_\_\_\_
- 05.2.08 Develop varieties of cotton with resistance to Aspergillus flavus or A. paraciticus. \_\_\_\_\_

### Processing and Marketing

- 05.2.09 Improve the liquid cyclone process for removing gossypol. \_\_\_\_\_

## 5.2 COTTONSEED

(Continued)

Enter Rating  
Here

### Processing and Marketing (continued)

- 05.2.10 Determine the most desirable physical characteristics of cottonseed for processing and yield of food products. \_\_\_\_\_
- 05.2.11 Investigate cottonseed protein extracts and ways of using them in food products. \_\_\_\_\_
- 05.2.12 Develop improved methods of removing glands from meal. \_\_\_\_\_
- 05.2.13 Develop improved methods for separating protein into its components. \_\_\_\_\_
- 05.2.14 Evaluate the potential of cottonseed products in world markets. \_\_\_\_\_

### Consumer Needs and the Environment

- 05.2.15 Study the effect of natural cotton constituents on human growth and development. \_\_\_\_\_
- 05.2.16 Improve monitoring for possible mycotoxin contamination. \_\_\_\_\_
- 05.2.17 Conduct research to help establish pesticide tolerance levels. \_\_\_\_\_
- 05.2.18 Determine the most efficient uses of cottonseed protein and oil in food products. \_\_\_\_\_
- 05.2.19 Develop production systems that use the optimum combination of chemical and biological inputs. \_\_\_\_\_
- 05.2.20 Develop ways to defoliate cotton with such approaches as direct stalk application of harmless chemicals, or plant types that tend to defoliate naturally. \_\_\_\_\_

### 5.3 PEANUTS

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#### OBJECTIVE:

To provide an adequate and nutritious supply of peanut protein and oil to meet the domestic and world needs with minimal adverse environmental impact.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Production

Enter Rating  
Here

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- 05.3.01 Develop varieties with higher yield potential, improved nutritional value, improved flavor and flavor stability, better handling and processing quality, and with resistance to diseases and insects. \_\_\_\_\_
- 05.3.02 Identify and evaluate genetic material that carries resistance to diseases and pests. \_\_\_\_\_
- 05.3.03 Collect, evaluate and maintain sources of genetic variability from cultivated and wild species. \_\_\_\_\_
- 05.3.04 Develop systems to control diseases and pests, including biological control. \_\_\_\_\_
- 05.3.05 Develop production and harvesting systems that will combine most energy efficiency with least environmental impact. \_\_\_\_\_
- 05.3.06 Determine environmental factors and production practices that affect seed viability and germination, and seedling vigor. \_\_\_\_\_
- 05.3.07 Develop production systems to achieve maximum yield at minimum cost and least loss of soil and water. \_\_\_\_\_

#### Processing and Marketing

- 05.3.08 Improve equipment for curing peanuts, including use of alternate energy sources. \_\_\_\_\_



## 5.3 PEANUTS

(Continued)

Enter Rating  
Here

### Processing and Marketing (continued)

- 05.3.09 Develop new peanut products such as flour, meals, grits, protein concentrates and isolates, etc. \_\_\_\_\_
- 05.3.10 Develop economic uses for peanut hulls, skins, wheys and other byproducts. \_\_\_\_\_
- 05.3.11 Establish the feasibility of substituting peanuts for other sources of protein in domestic and foreign markets. \_\_\_\_\_
- 05.3.12 Develop new systems to evaluate grade and quality of peanuts. \_\_\_\_\_

### Policy Adjustments

- 05.3.13 Determine the potential impact of alternative Federal policies on the industry, producer income, consumers, location and level of production and on program costs. \_\_\_\_\_

### Consumer Needs

- 05.3.14 Develop ways to prevent contamination by toxic molds. \_\_\_\_\_
- 05.3.15 Develop practical ways to detoxify peanuts and peanut products contaminated with mycotoxins. \_\_\_\_\_
- 05.3.16 Develop better ways to prevent mycotoxins from forming before and immediately after digging. \_\_\_\_\_
- 05.3.17 Design better storage facilities and transportation to minimize mycotoxin contamination. \_\_\_\_\_
- 05.3.18 Determine realistic and safe levels of aflatoxin in peanuts used for animal food. \_\_\_\_\_

### Basic Research

- 05.3.19 Determine the plant reactions that control peanut growth, flowering, and fruiting, and their interaction with the environment. \_\_\_\_\_
- 05.3.20 Develop field and laboratory techniques for assessing pest and disease resistance. \_\_\_\_\_



## 5.4 SUNFLOWER, SAFFLOWER AND OTHER OILSEEDS

### OBJECTIVE:

To provide an adequate supply of protein and vegetable oil from oilseeds such as sunflower and safflower to meet the expanding domestic and world needs, with minimum adverse environmental impact.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Production

- 05.4.01 Develop management systems to make most effective use of available moisture, nutrients and growing seasons. 

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- 05.4.02 Reduce the genetic vulnerability to pests of safflowers, sunflowers, rapeseed and flax. 

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- 05.4.03 Develop high-yielding, more widely adapted varieties of sunflower, safflower and flax. 

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- 05.4.04 Improve insect and disease resistance in domestic sunflower varieties. 

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- 05.4.05 Develop hybrid sunflower varieties adapted to specific production areas. 

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- 05.4.06 Develop high yielding safflowers with resistance to Fusarium wilt, Verticillium wilt, Phytophthora root rot, and rust. 

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- 05.4.07 Develop high yielding, rust resistant varieties of flax. 

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- 05.4.08 Develop flax germ plasm with greater variability than now available through hybridization. 

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- 05.4.09 Develop multi-cropping systems to make better use of available land, moisture and plant nutrients for higher yields. 

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5.4 SUNFLOWER, SAFFLOWER AND OTHER OILSEEDS  
(Continued)

Enter Rating  
Here

Production (continued)

- 05.4.10 Determine the conditions and cropping situations under which specific oil-protein crops have a comparative advantage. \_\_\_\_\_
- 05.4.11 Breed more photosynthetic efficiency into sunflowers, safflowers and flax. \_\_\_\_\_
- 05.4.12 Develop production practices to maximize yields with minimum tillage. \_\_\_\_\_

Marketing

- 05.4.13 Evaluate the potential for plant protein products in both U.S. and foreign markets. \_\_\_\_\_
- 05.4.14 Evaluate the impact on the U.S. oilseed market of changing world production patterns. \_\_\_\_\_

Consumer needs

- 05.4.15 Develop sunflower varieties with desired combinations of fatty acids. \_\_\_\_\_
- 05.4.16 Determine the genetic variability of nutrient factors in oil-protein crops. \_\_\_\_\_
- 05.4.17 Improve flavor and odor stability of salad and cooking oils, and raise their polyunsaturated content. \_\_\_\_\_
- 05.4.18 Eliminate or minimize hazards of mycotoxins and pesticide residues in oilseeds and their products. \_\_\_\_\_
- 05.4.19 Determine consumer acceptance of new foods or products developed from plant oils and protein. \_\_\_\_\_

Basic research

- 05.4.20 Develop more understanding of the genetics of oilseed crops. \_\_\_\_\_

## 5.5 SUGAR

### OBJECTIVE:

To assure an adequate, stable supply of domestic and foreign sugar to meet U.S. and world needs, with desirable socioeconomic and environmental impacts.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

### Sugarcane

Enter Rating  
Here

- |         |   |       |
|---------|---|-------|
| 05.5.01 | Develop sugarcane varieties adaptable to mechanical harvesting, with high yield, good quality, early maturity, and resistance to pests, cold, salinity and drought. | _____ |
| 05.5.02 | Develop integrated pest management systems.   | _____ |
| 05.5.03 | Develop techniques to modify sugarcane maturity and improve quality.  | _____ |
| 05.5.04 | Develop physiological and biochemical knowledge for improved sugar content and quality, biological pest control, and increased plant vigor and tillering.           | _____ |
| 05.5.05 | Develop new or improved means of preventing sucrose losses from inversion and frozen or damaged cane.   | _____ |
| 05.5.06 | Develop improved mechanical harvesters for sugarcane.   | _____ |
| 05.5.07 | Evaluate the processing quality of new varieties.   | _____ |

### Sugarbeets

- |         |   |       |
|---------|---|-------|
| 05.5.08 | Find sources of pest resistance and incorporate them into new varieties with high sucrose and yield potential for different production areas. |       |
| 05.5.09 | Study pathogenic agents affecting the sugarbeet, and develop control measures.  | _____ |

## 5.5 SUGAR

(Continued)

Enter Rating  
Here

### Sugarbeets (Continued)

- 05.5.10 Develop ways to increase production under adverse conditions such as cool soil temperatures, saline soils, lower water supply and reduced nitrogen. \_\_\_\_\_
- 05.5.11 Develop more reliable, safe and selective herbicide treatments. \_\_\_\_\_
- 05.5.12 Develop varieties and cultural practices that will improve processing quality at harvest and after storage. \_\_\_\_\_
- 05.5.13 Develop practices to improve seed germination and to encourage faster and more vigorous emergence. \_\_\_\_\_
- 05.5.14 Develop new ways to handle beets in storage that will maintain harvest quality, and reduce losses of sugar. \_\_\_\_\_

### Other Sugar Crops (Sweet Sorghum, Corn)

- 05.5.15 Develop cultural practices to increase production and allow for mechanical harvesting. \_\_\_\_\_
- 05.5.16 Develop sweet sorghum varieties that are high in sucrose and with good juice characteristics, and that also resists pests and can be mechanically harvested. \_\_\_\_\_
- 05.5.17 Evaluate the possibilities of processing sorghum in sugarcane factories as a supplementary operation. \_\_\_\_\_
- 05.5.18 Improve techniques to remove impurities that interfere with crystallization of sucrose. \_\_\_\_\_

### Marketing

- 05.5.19 Develop a model system to provide information on sugar supply and demand, price stability, and producer returns--with and without a "Sugar Act." \_\_\_\_\_
- 05.5.20 Determine the potential for expanded U.S. domestic sugar production, and the ability of U.S. producers and processors to stay in production at lower prices. \_\_\_\_\_

## 6.1 VEGETABLES

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### OBJECTIVE:

To provide an adequate supply of high quality, safe and nutritious vegetables with high consumer acceptance, consistent with good agricultural practices and environmental concerns.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

---

	Enter Rating Here
<u>Production</u>	
06.1.01 Develop varieties, machinery and methods for mechanized vegetable production.	_____
06.1.02 Determine the plant factors that affect vegetable quality in order to meet consumer needs and regulation requirements.	_____
06.1.03 Develop basic new methods of improving yields, such as nitrogen fixation and improved photosynthetic efficiency.	_____
06.1.04 Develop energy-efficient, high-yielding, high-quality, pest-resistant varieties of vegetables.	_____
06.1.05 Develop improved vegetable breeding approaches such as incorporation of a wider base of germ plasm (more heterosis) into new varieties.	_____
<u>Crop Protection</u>	
06.1.06 Develop nonchemical means of insect control such as repellants, predators, and insect pathogens.	_____
06.1.07 Develop integrated pest control systems, including management practices and crop sequences, to minimize the need for chemicals.	_____
06.1.08 Develop improved pesticides and methods of application, including new chemicals, particularly for minor vegetable crops.	_____

## 6.1 VEGETABLES

(Continued)

Enter Rating  
Here

### Processing and Marketing (Continued)

- 06.1.09 Develop and maintain germ plasm banks to facilitate development of pest resistance, and for study of host-parasite interactions. \_\_\_\_\_
- 06.1.10 Develop processing methods to capture more of the nutritional value of products. \_\_\_\_\_
- 06.1.11 Develop processing methods to get greater recovery from the raw product and to lower processing costs and energy consumption. \_\_\_\_\_
- 06.1.12 Develop improved postharvest handling of fresh vegetables to maintain quality and appearance and to reduce losses. \_\_\_\_\_
- 06.1.13 Develop methods to better maintain nutritional quality of vegetables during transit and storage. \_\_\_\_\_
- 06.1.14 Improve storage and shelf life of vegetables through use of natural inhibitors, modified atmospheres, and optimum temperatures and humidities. \_\_\_\_\_

### Consumer Needs and the Environment

- 06.1.15 Determine the nutritional qualities of all vegetables and the roles they play in human nutrition; improve those qualities by breeding and cultural practices. \_\_\_\_\_
- 06.1.16 Identify naturally occurring toxicants and determine their genetic behavior. \_\_\_\_\_
- 06.1.17 Determine new uses of processing wastes for feed, fertilizer or byproducts. \_\_\_\_\_
- 06.1.18 Minimize the environmental hazards of agricultural chemicals used in vegetable production. \_\_\_\_\_

### Basic Research Needs

- 06.1.19 Increase understanding of vegetable genetics and physiology, with emphasis on crop performance. \_\_\_\_\_



## 6.1 VEGETABLES

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(Continued)

Enter Rating  
Here

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### Basic Research Needs (Continued)

- 06.1.20 Determine the roles of genetics and environment in pest resistance; also the factors involved in host-parasite interactions, including survival of pathogens.
-





## 6.2 POTATOES

### OBJECTIVE:

To meet continuing domestic and world needs for safe, high quality potatoes and potato products with higher consumer and user acceptability, consistent with sound management of resources and environmental concerns.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

### Production and Storage

Enter Rating  
Here

- 06.2.01 Improve approaches to potato breeding, such as incorporating a wider base of germ plasm (more heterosis) into new varieties. \_\_\_\_\_
- 06.2.02 Improve photosynthetic efficiency and nutrient uptake. \_\_\_\_\_
- 06.2.03 Develop new varieties with better nutritional value, better processing characteristics, improved pest resistance and adapted to a wider range of environmental conditions. \_\_\_\_\_
- 06.2.04 Develop cultural practices to lower production costs. \_\_\_\_\_
- 06.2.05 Develop methods to reduce losses of potatoes in storage for long periods of time. \_\_\_\_\_
- 06.2.06 Develop more efficient methods of inducing maturity and decreasing bruising during mechanical harvesting, storage, and handling. \_\_\_\_\_

### Crop Protection

- 06.2.07 Develop more efficient control for potato diseases. \_\_\_\_\_
- 06.2.08 Develop integrated pest management systems that are consistent with economic production of high quality potatoes. \_\_\_\_\_

## 6.2 POTATOES

(Continued)

Enter Rating  
Here

### Crop Protection (Continued)

- 06.2.09 Devise protection, including resistant varieties, against pests not now in the US, such as additional aggressive races of the golden nematode. \_\_\_\_\_
- 06.2.10 Develop improved pesticides that are specific against target species, degradable and of low mammalian toxicity; also methods of applying them. \_\_\_\_\_

### Processing and Marketing

- 06.2.11 Develop more acceptable products from surplus potatoes that can be easily transported and stockpiled as a food resource. \_\_\_\_\_
- 06.2.12 Develop low cost, efficient ways to use potato processing wastes for food, feed, byproducts, or other economic purposes. \_\_\_\_\_
- 06.2.13 Develop more efficient processing methods to get more recovery from the raw product while using less energy and processing oils. \_\_\_\_\_
- 06.2.14 Develop more desirable flavor in potato varieties and stabilize flavor in dehydrated potatoes. \_\_\_\_\_
- 06.2.15 Improve technology to maintain quality and appearance of fresh market potatoes, and to reduce losses in transit and storage. \_\_\_\_\_
- 06.2.16 Improve packaging methods or other systems to reduce transit losses. \_\_\_\_\_
- 06.2.17 Determine consumer preferences for potato products in foreign markets. \_\_\_\_\_
- 06.2.18 Develop concentrated, highly nutritional products acceptable to both developed and under-developed countries in order to exploit export opportunities. \_\_\_\_\_

## 6.2 POTATOES

(Continued)

Enter Rating  
Here

### Consumer Needs and the Environment

- 06.2.19 Determine more precisely the benefits of potatoes in human nutrition, and ways to prepare and use potatoes to maintain those benefits. \_\_\_\_\_
- 06.2.20 Develop methods to biodegrade potato wastes that are not acceptable for feed, fertilitizer, or other byproducts. \_\_\_\_\_



### 6.3 DRY BEANS AND PEAS

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#### OBJECTIVE:

To provide an adequate supply of dry beans, dry peas, and other pulse crops as a source of high quality and low cost protein, consistent with good agricultural practices and consumer preferences and well-being.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

---

#### Production

Enter Rating  
Here

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- 06.3.01 Develop efficient direct harvesters that thresh with little loss of beans in the field, and develop bean varieties suitable for mechanized harvesting. 

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- 06.3.02 Develop bean varieties with higher protein content and improved protein quality. 

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- 06.3.03 Improve bean tolerance to environmental stresses such as air pollution, herbicides, adverse soil conditions, cold, heat, and drought. 

---
- 06.3.04 Develop new approaches to bean breeding, such as incorporation of a wider base of germ plasm (more heterosis) into new varieties. 

---
- 06.3.05 Develop germ plasm with increased yield potential and breed it into commercial varieties. 

---
- 06.3.06 Improve plant growth and reproduction by such means as nitrogen fixation and more efficiency of fertilizer use. 

---
- 06.3.07 Discover rapid, dependable techniques for evaluating essential amino acid content of raw beans as an aid in genetic improvement. 

---
- 06.3.08 Search for germ plasm to reduce flatulence. 

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### 6.3 DRY BEANS AND PEAS

(Continued)

Enter Rating  
Here

#### Crop Protection

- 06.3.09 Develop integrated pest management systems consistent with economic production of high quality dry beans.

#### Processing and Marketing

- 06.3.10 Improve postharvest handling of dry beans at all levels.
- 06.3.11 Develop new and improved processed products with quality, convenience, stability, wholesomeness, and low cost.
- 06.3.12 Develop information required by dry bean producers to meet the GRAS requirements under the Pure Food and Drug regulations.

#### Consumer Needs

- 06.3.13 Find methods of reducing flatulence caused by legume consumption.
- 06.3.14 Improve flavor and food quality.
- 06.3.15 Develop more convenient dry bean products for consumers, such as dry bean powders or precooked products.
- 06.3.16 Discover means to reduce or eliminate growth inhibitors and hemagglutinins.

#### Basic Research Needs

- 06.3.17 Increase understanding of dry bean genetics and physiology, with emphasis on crop performance.
- 06.3.18 Investigate the nature and genetic control of non-specific resistance to pests and pathogens.

### 6.3 DRY BEANS AND PEAS

(Continued)

Enter Rating  
Here

Basic Research Needs (Continued)

- 06.3.19 Determine how much pathogens vary, and the mechanism of variability. \_\_\_\_\_
- 06.3.20 Study pest resistance and factors involved in host-parasite interactions, including effects of the environment on disease development and survival of pathogens. \_\_\_\_\_





## 7.1 FRUITS AND NUTS

### OBJECTIVE:

To develop improved production and distribution systems and maintain an adequate supply of competitively priced, high-quality fruit and nut crops, consistent with good agricultural practices and environmental concerns.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Production

- 07.1.01 Develop improved fruit and nut varieties that are high-yielding, high-quality, early-bearing, pest resistant and are adapted to mechanical harvesting. \_\_\_\_\_
- 07.1.02 Increase mechanization of cultural and harvest operations. \_\_\_\_\_
- 07.1.03 Collect and maintain germplasm to provide a wider genetic base for future breeding programs. \_\_\_\_\_
- 07.1.04 Modify tree training and cultural systems to increase production and make more efficient use of land, water, fertilizers and labor. \_\_\_\_\_
- 07.1.05 Improve rootstocks to minimize losses from pests and environmental stress, and to increase tree densities and per acre production. \_\_\_\_\_
- 07.1.06 Investigate ways to alleviate problems in labor supply during production and marketing. \_\_\_\_\_

### Crop Protection

- 07.1.07 Reduce tree losses of major fruit and nut crops, such as short life of peaches in the Southeast and young tree decline of citrus in Florida. \_\_\_\_\_

## 7.1 FRUITS AND NUTS

(Continued)

Enter Rating  
Here

### Crop Protection (Continued)

- |         |   |       |
|---------|---|-------|
| 07.1.08 | Develop and test environmentally safe chemical pesticides, and provide registration data.   | _____ |
| 07.1.09 | Evaluate existing regulations and controls on chemicals, to remove unnecessary restrictions during production, harvesting, marketing, and preservation. | _____ |
| 07.1.10 | Develop more efficient application methods for chemical pesticides.   | _____ |
| 07.1.11 | Increase efficiency of pest monitoring systems to improve timing of biological and chemical control measures.   | _____ |
| 07.1.12 | Develop registration data for minor-use chemicals to increase their availability on fruit and nut crops.  | _____ |
| 07.1.13 | Improve methods of control for diseases, insects, nematodes, and weeds.   | _____ |

### Processing and Marketing

- |         |  |       |
|---------|--|-------|
| 07.1.14 | Improve processing methods to minimize loss of quality and nutrients, and to save energy.  | _____ |
| 07.1.15 | Develop techniques for automatic handling, bruise detection, sorting, and nondestructive quality evaluation of fruit products in the processing plant. | _____ |
| 07.1.16 | Evaluate the effects of production and cultural systems, including maturity, on storage, quality and nutritional characteristics of fruits and nuts.   | _____ |
| 07.1.17 | Improve packaging and handling methods for fresh fruit to reduce losses and maintain quality.  | _____ |

## 7.1 FRUITS AND NUTS

(Continued)

Enter Rating  
Here

### Processing and Marketing (Continued)

- 07.1.18 Develop more efficient packaging, handling, transport and refrigeration methods for perishable fruit and nut commodities moving to export markets.

### Consumer Needs

- 07.1.19 Determine the role in human health and nutrition of components of fruits and such as vitamins, bioflavenoids, and metals.

### Basic Research Needs

- 07.1.20 Investigate hormones and their control of growth, flowering, fruiting, etc., so as to better control tree physiology and increase production.



## 7.2 BEES AND OTHER POLLINATING INSECTS

### OBJECTIVE:

To fully utilize the food producing capability of the honeybee and other pollinating insects by maintaining a viable and growing bee and pollinating insect industry.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

### Production

Enter Rating  
Here

- 07.2.01 Protect colonies from pesticides. \_\_\_\_\_
- 07.2.02 Develop strains with improved honey production. \_\_\_\_\_
- 07.2.03 Improve efficiency of queen development techniques for commercial queen producers. \_\_\_\_\_
- 07.2.04 Improve efficiency of requeening. \_\_\_\_\_
- 07.2.05 Further improve genetic quality of package bees and queens. \_\_\_\_\_
- 07.2.06 Increase availability of early queens. \_\_\_\_\_
- 07.2.07 Develop support crops to maintain pollinators during off season. \_\_\_\_\_
- 07.2.08 Develop strains with greater queen productivity. \_\_\_\_\_
- 07.2.09 Determine effect of climatic variables on queen productivity. \_\_\_\_\_
- 07.2.10 Develop strains that winter better. \_\_\_\_\_
- 07.2.11 Improve artificial diets. \_\_\_\_\_

## 7.2 BEES AND OTHER POLLINATING INSECTS

(Continued)

Enter Rating  
Here

### Production (Continued)

- 07.2.12 Improve wild insect pollinator  
management and selection. \_\_\_\_\_

### Protection

- 07.2.13 Protect colonies from American Foul Brood. \_\_\_\_\_
- 07.2.14 Develop strains more resistant to disease. \_\_\_\_\_
- 07.2.15 Protect bee frames from wax moth. \_\_\_\_\_
- 07.2.16 Protect colonies from nosema disease. \_\_\_\_\_
- 07.2.17 Protect colonies from African bees. \_\_\_\_\_

### Processing and Marketing

- 07.2.18 Improve environmental controls in transport  
of package bees and queens. \_\_\_\_\_
- 07.2.19 Improve contractual arrangements with growers. \_\_\_\_\_
- 07.2.20 Evaluate any proposed modifications in  
honey processing, including additives for  
potential hazards. \_\_\_\_\_
- 02.2.21 Identify grower needs for pollination. \_\_\_\_\_

## 8.1 HARVESTED FORAGES AND SEED PRODUCTION

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### OBJECTIVE:

To improve the economic productivity and the quality of forage crops harvested for preservation, and to assure an adequate supply of high quality seed for forage species.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### New varieties

Enter Rating  
Here

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- 08.1.01 Collect, assess and maintain germ plasm of forage species for current and future use. \_\_\_\_\_
- 08.1.02 Develop varieties with multiple resistance to insects, diseases and nematodes. \_\_\_\_\_
- 08.1.03 Develop grasses and legumes that are free of or have low concentrations of problem components (bloat-causing agents in legumes, alkaloids in grasses, cyanogenic components, etc.). \_\_\_\_\_
- 08.1.04 Develop grasses and legumes high in protein, digestibility, palatability, and intake potential. \_\_\_\_\_

### Production

- 08.1.05 Determine the factors that limit pollination in legume seed fields, and the effects of pest control practices on bees and other beneficial insects. \_\_\_\_\_
- 08.1.06 Develop improved approaches to timing of harvest, in order to increase persistence and productivity of grasses and legumes. \_\_\_\_\_
- 08.1.07 Develop a one-pass harvest system that eliminates the weather hazard, reduces labor, and maintains quality. \_\_\_\_\_
- 08.1.08 Devise alternative ways of harvesting, storing and feeding harvested forages in order to maintain quality, reduce losses or waste, and improve efficiency. \_\_\_\_\_



## 8.1 HARVESTED FORAGES AND SEED PRODUCTION

(Continued)

Enter Rating  
Here

### Production (Continued)

- 08.1.09 Develop methods of harvesting, processing and preserving crop residues to be fed directly, or to be chemically or physically modified to increase their quality for feed to livestock. \_\_\_\_\_
- 08.1.10 Develop mechanical dewatering processes to reduce cost of dehydration; also develop methods for utilizing the removed "water" in liquid feeds, reconstituted grains, etc. \_\_\_\_\_
- 08.1.11 Evaluate the potential of integrating forage-livestock systems with disposal of effluent and solid wastes (agricultural and non-agricultural). \_\_\_\_\_

### Utilization and Marketing

- 08.1.12 Develop economical animal management systems that include such alternatives as use of crop residues, semi-confinement, supplemental feeding, early calf weaning, bulk harvested and stored forages, and dormant standing forages. \_\_\_\_\_
- 08.1.13 Determine best formulation of forage-supplement diets to meet specific livestock production targets. \_\_\_\_\_
- 08.1.14 Improve methods to analyze and predict forage quality, so that forage products can be marketed according to established standards for use in least-cost, computer-formulated rations. \_\_\_\_\_
- 08.1.15 Develop methods to fractionate herbage into commercial products other than forage itself, such as protein, chlorophyll, chemicals, drugs, etc. \_\_\_\_\_
- 08.1.16 Improve methods for conserving and increasing the biological activity of protein, carotene, and xanthophylls. \_\_\_\_\_
- 08.1.17 Increase the biological availability of carbohydrate and protein in high fiber feeds, using fermentation or other methods. \_\_\_\_\_



## 8.1 HARVESTED FORAGES AND SEED PRODUCTION

(Continued)

Enter Rating  
Here

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### Pest Control

- 08.1.18 Develop integrated management programs for key pest species, including resistant varieties, pest population suppression (crop management, repellents, baits, etc.), use of beneficial insects and improved pesticides.

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### Basic Research Needs

- 08.1.19 Investigate fundamental genetic and cytological phenomena that hinder plant improvement, or that have potential use as breeding tools.
- 08.1.20 Develop more effective breeding procedures (male sterility, fertility restoration, genetic markers, self-incompatibility, etc.) to improve biological efficiency and yield.

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## 8.2 PERMANENT, ROTATION AND IRRIGATED PASTURES

### OBJECTIVE:

To improve the economic productivity and utilization of permanent, rotation and irrigated pastures.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

<u>Production</u>	<u>Enter Rating Here</u>
08.2.01 Develop grass and legume varieties that are compatible in forage mixtures.	_____
08.2.02 Develop grass and legume varieties capable of rapid recovery and high yield.	_____
08.2.03 Develop grasses and legumes high in protein, digestibility, palatability, and intake potential.	_____
08.2.04 Collect, assess and maintain germ plasm of forage species for current and future use.	_____
08.2.05 Determine the interaction of soil, water, and fertilizer, in order to establish best levels of fertilization to make best use of water.	_____
08.2.06 Develop harvesting and grazing systems, using both annual and perennial forages, to achieve full-season utilization of forage and improve production per unit area.	_____
08.2.07 Match grasses and legumes, in combination with fertilizer and management, to maintain balance of grasses and legumes, and to increase yield and quality.	_____
08.2.08 Develop irrigation practices for various soil types, grassland regions, and types and mixes of forages to optimize efficiency of water use.	_____
08.2.09 Improve techniques for introducing improved perennial grasses and legumes into permanent sod; i.e., seed treatments, chemical renovation, sod seeding equipment, fertilizer placement, etc.	_____

8.2 PERMANENT, ROTATION AND IRRIGATED PASTURES  
(Continued)

Enter Rating  
Here

Production (continued)

- 08.2.10 Improve methods of establishing temporary crops in permanent sod--i.e., mechanical and chemical treatments, plant nutrition, time and method of renovation, early seedling management, etc. \_\_\_\_\_
- 08.2.11 Develop equipment for precision metering and placement of seed, fertilizer and chemicals, and for better vegetative propagation. \_\_\_\_\_

Appraisal of resources

- 08.2.12 Develop standardized procedures for a nationwide inventory of forage resources. \_\_\_\_\_

Utilization

- 08.2.13 Develop rapid, accurate laboratory procedures for predicting forage quality, intake and digestibility. \_\_\_\_\_
- 08.2.14 Reevaluate pasture systems, using superior forages and animals. \_\_\_\_\_
- 08.2.15 Develop practices for economical production of livestock on pasture (stocking rates, grazing systems, combinations of livestock, overseeding or sod seeding, etc.). \_\_\_\_\_
- 08.2.16 Determine the characteristics of major forages and forage mixtures (production patterns, response to grazing and harvesting, quality, etc.) in order to fit forages into specific animal production programs. \_\_\_\_\_
- 08.2.17 Determine the minimum rate of production for various classes and weights of animals that will provide animal products with quality acceptable to consumers and at a cost-price ratio profitable to producers. \_\_\_\_\_

Basic research

- 08.2.18 Investigate soil-plant-animal relationships to improve animal production and forage quality and quantity. \_\_\_\_\_

## 8.2 PERMANENT, ROTATION AND IRRIGATED PASTURES

(Continued)

Enter Rating  
Here

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### Basic Research (Continued)

- 08.2.19 Develop basic data on animal utilization and response (forage intake, availability, digestibility, rumen residence time, rate of passage, etc.) in order to design better forage-animal systems. \_\_\_\_\_
- 08.2.20 Provide information on the interaction of pastures and animals, including effects of forage use patterns on productivity of pastures and animals. \_\_\_\_\_



### 8.3 RANGE

#### OBJECTIVE:

To improve the economic productivity and utilization of rangelands to provide live-stock and livestock products with quality and at prices attractive to consumers.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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#### Resource Appraisal

Enter Rating  
Here

- 08.3.01 Develop standardized procedures for a nation-wide inventory of range resources. \_\_\_\_\_
- 08.3.02 Evaluate the potential for forage production on all range areas, and determine forage species suitable for various soil conditions. \_\_\_\_\_
- 08.3.03 Develop and test remote sensing techniques for measuring vegetation, soil stability, site attributes, forage utilization, animal populations and movement, and major factors of range environment. \_\_\_\_\_

#### Variety Improvement

- 08.3.04 Develop varieties with more tolerance to such stresses as drought, temperature extremes, saline soils, alkaline and acid soils, and poor drainage. \_\_\_\_\_
- 08.3.05 Develop legume varieties adapted to grazing in semi-arid areas. \_\_\_\_\_
- 08.3.06 Develop improved shrubs, grasses and forbs for semi-arid rangelands. \_\_\_\_\_

#### Production

- 08.3.07 Evaluate rangeland seeding for livestock production, improvement of watersheds, and restoration of deteriorated ranges. \_\_\_\_\_
- 08.3.08 Develop new approaches to (1) increase water intake of soils and (2) control evaporation and transpiration. \_\_\_\_\_

### 8.3 RANGE

(Continued)

<u>Production (Continued)</u>		Enter Rating Here
08.3.09	Develop more effective strains of rhizobia and better ways to inoculate soils for specific legume varieties and soil conditions.	_____
08.3.10	Develop alternative grazing management systems combined with advanced range improvement methods.	_____
08.3.11	Develop ways to more successfully establish seeded species; including grasses, forbs and browse species.	_____
08.3.12	Determine potential success of seeding for specific range sites and identify species and varieties adapted for use in them.	_____
08.3.13	Develop efficient combinations of treatments (grazing management, chemicals, mechanical treatments, controlled burning, etc.) to control brush and other weeds.	_____
08.3.14	Learn how to modify existing management practices in order to slow the reinvasion of grazing lands by brush and other plants.	_____
08.3.15	Compare costs and benefits of the most promising systems of brush and weed control on grazing lands.	_____
08.3.16	Integrate forage production and animal management systems to improve reproductive efficiency and the percentage of calves weaned.	_____
08.3.17	Select animal types particularly adapted to use rangeland forages.	_____
08.3.18	Develop effective optimization models for determining alternative grazing ecosystem use.	_____
<u>Basic Research</u>		
08.3.19	Develop methods to determine range forage intake and digestibility by grazing animals and associated digestibility values obtained in vitro.	_____



### 8.3 RANGE

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(Continued)

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#### Basic Research (Continued)

- 08.3.20 Develop better knowledge of soil and micro-climate factors affecting seed germination and survival and vigor of seedlings.



## 9.1 BEEF

### OBJECTIVE:

To produce the quality and quantity of beef required to help meet human food demands, with maximum efficiency in the use of land, animal and feed resources, while maintaining environmental quality, reasonable profit margins, and retail prices that are compatible with consumer incomes.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Resource Appraisal

- 09.1.01 Determine the land, animal and feed resources available now and potentially available in the future for beef production.

\_\_\_\_\_

### Production

- 09.1.02 Improve ways to use non-competitive feeds such as crop residues, byproducts, etc.
- 09.1.03 Develop methods to increase production from range, silage and pasture with new forages, fertilization, mechanical soil treatments and management.
- 09.1.04 Improve reproductive performance by identifying factors that (1) increase calf survival and (2) shorten the interval from one calving to the next.
- 09.1.05 Improve reproductive performance by developing techniques for estrus control and multiple calving.
- 09.1.06 Improve reproductive performance through breeding systems, including crossbreeding.

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### Disease Control

- 09.1.07 Reduce effects of respiratory and enteric diseases, including shipping fever and calf scours.

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## 9.1 BEEF

(Continued)

Enter Rating  
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### Disease Control (Continued)

- 09.1.08 Prevent foot-and-mouth disease, and other foreign animal diseases. \_\_\_\_\_
- 09.1.09 Prevent and control pink-eye, foot rot, anaplasmosis, etc. \_\_\_\_\_
- 09.1.10 Prevent and control reproductive diseases, including leptospirosis, vibriosis and brucellosis. \_\_\_\_\_
- 09.1.11 Prevent and control internal and external parasites. \_\_\_\_\_

### Processing and Marketing

- 09.1.12 Improve methods of converting the live animal to edible products. \_\_\_\_\_
- 09.1.13 Improve marketing procedures, including slaughter and processing, storage, merchandising, and maintenance of nutritional and eating qualities. \_\_\_\_\_
- 09.1.14 Continuously evaluate foreign market potential for beef and live cattle, and the impact of imports. \_\_\_\_\_
- 09.1.15 Develop methods to more accurately forecast economic trends, including cycles in feed and beef supplies and prices. \_\_\_\_\_

### Consumer Needs and the Environment

- 09.1.16 Develop methods to better determine residue levels of feed additives, growth stimulants, chemical residues, etc. \_\_\_\_\_
- 09.1.17 Develop control methods for insect pests of livestock that minimize environmental contamination. \_\_\_\_\_
- 09.1.18 Develop efficient ways to convert manure and other organic farm and processing wastes into usable byproducts; also determine how much waste can go onto the soil without affecting crop yield or quality, or groundwater. \_\_\_\_\_

## 9.2 PORK

### OBJECTIVE:

To produce the quantity and quality of pork required to help meet human food needs, with maximum efficiency in the use of land, animal and feed resources, while maintaining environmental quality, reasonable profit margins and retail prices that are compatible with consumer incomes.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

Enter Rating  
Here

### Production

- 09.2.01 Increase the pig crop by such means as lower mortality of unborn animals, control of estrus and ovulation, and nutrition. \_\_\_\_\_
- 09.2.02 Develop breeding systems to maximize heterosis of growth and carcass traits in crossbreed animals. \_\_\_\_\_
- 09.2.03 Determine the effects of housing and management on feed conversion. \_\_\_\_\_
- 09.2.04 Determine the influence of nutrients on hormones affecting reproduction and carcass composition. \_\_\_\_\_
- 09.2.05 Determine the effect of genetics and selection on feed efficiency. \_\_\_\_\_

### Disease Control

- 09.2.06 Develop more effective technology to reduce the incidence of enteric, reproductive and respiratory diseases. \_\_\_\_\_
- 09.2.07 Develop improved methods to prevent and control swine arthritis. \_\_\_\_\_
- 09.2.08 Improve the diagnosis, prevention and control of foreign animal diseases that threaten the U.S. swine population (African swine fever, swine vesicular disease, foot-and-mouth disease, etc.). \_\_\_\_\_

## 9.2 PORK

(Continued)

Enter Rating  
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### Disease Control (Continued)

- 09.2.09 Develop improved methods to prevent and control parasites of swine. \_\_\_\_\_

### Processing and Marketing

- 09.2.10 Evaluate the need for a system of grade and yield pricing that would be equitable to producers, processors and consumers. \_\_\_\_\_
- 09.2.11 Evaluate the need for better market communication systems. \_\_\_\_\_
- 09.2.12 Evaluate hot processing of pork and other rapid processing systems; centralized packaging of fresh pork; and the market for new pork products. \_\_\_\_\_
- 09.2.13 Investigate ways to reduce effects of pork stress syndrome (PSS) and pale, soft, exudative pork (PSE). \_\_\_\_\_
- 09.2.14 Identify other countries that are potential customers for pork products, and develop the technology needed to export safe, high-quality pork and pork products. \_\_\_\_\_
- 09.2.15 Develop international standards on diseases of live animals, and quality identification standards for U.S. products to meet foreign market requirements. \_\_\_\_\_

### Consumer Needs and the Environment

- 09.2.16 Develop meaningful consumer preference information, and quality standards for pork to help the consumer in selecting wholesome, flavorful and safe pork. \_\_\_\_\_
- 09.2.17 Develop energy conservation procedures in all phases of the swine industry. \_\_\_\_\_
- 09.2.18 Develop swine housing and waste disposal or handling procedures that are efficient and also protect environmental quality. \_\_\_\_\_



### 9.3 LAMB AND MUTTON

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#### OBJECTIVE:

To produce the quality and quantity of sheep meat required to help meet human food demands, with maximum efficiency in the use of land, animals and feed resources, while maintaining environmental quality, reasonable profit margins, and retail prices that are compatible with consumer incomes.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
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#### Production

- 09.3.01 Increase lambs per ewe per year by such means as selection, crossbreeding, and the use of hormones. \_\_\_\_\_
- 09.3.02 Develop methods of reducing predator losses under a wide variety of range and farm conditions. \_\_\_\_\_
- 09.3.03 Increase efficiency of feed use by such means as selection and crossbreeding. \_\_\_\_\_
- 09.3.04 Determine nutrient requirements for all phases of sheep growth, maintenance and reproduction. \_\_\_\_\_
- 09.3.05 Prevent or reduce losses from diseases and parasites, and from poisonous plants and other toxic substances. \_\_\_\_\_
- 09.3.06 Reduce losses from reproductive diseases. \_\_\_\_\_
- 09.3.07 Develop combinations of new methods for breeding, reproduction, nutrition, and management. \_\_\_\_\_
- 09.3.08 Develop low cost treatments to make the nutrients in poor quality feeds more available. \_\_\_\_\_

#### Processing and Marketing

- 09.3.09 Develop ways to cut and package so that (1) lamb and mutton products will not require further processing after the slaughtering plant and (2) shelf life will be increased. \_\_\_\_\_

### 9.3 LAMB AND MUTTON

(Continued)

Enter Rating  
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#### Processing and Marketing (Continued)

- 09.3.10 Develop grading standards for lambs that are meaningful to producers, processors and distributors. \_\_\_\_\_

#### Consumer Needs

- 09.3.11 Develop new products from lamb and mutton to improve consumer acceptance. \_\_\_\_\_
- 09.3.12 Conduct consumer tests to determine their preferences for product characteristics and services. \_\_\_\_\_



## 9.4 OTHER ANIMAL PRODUCTS

### OBJECTIVE:

To fully utilize food producing capabilities of other animals such as rabbits and goats, and to maximize their productivity consistent with environmental quality and alternate uses of resources.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

### Rabbits

Enter Rating  
Here

- 09.4.01 Develop ways to use low-cost and noncompetitive feeds. \_\_\_\_\_
- 09.4.02 Reduce death losses, especially of young animals. \_\_\_\_\_
- 09.4.03 Develop better methods to prevent and control diseases, particularly enteritis and respiratory diseases. \_\_\_\_\_

### Goats

- 09.4.04 Develop procedures to select important productivity traits in goats. \_\_\_\_\_
- 09.4.05 Evaluate the comparative efficiency of meat production by meat-type and dairy goats. \_\_\_\_\_
- 09.4.06 Develop better management to increase efficiency. \_\_\_\_\_
- 09.4.07 Evaluate the potential of goats for biological control of brush and noxious plants in different parts of the U.S. \_\_\_\_\_
- 09.4.08 Overcome seasonal breeding habits of goats. \_\_\_\_\_
- 09.4.09 Develop efficient artificial insemination techniques for dairy goats. \_\_\_\_\_
- 09.4.10 Develop a sire evaluation program for goats similar to that used for dairy cattle. \_\_\_\_\_

#### 9.4 OTHER ANIMAL PRODUCTS

(Continued)

Enter Rating  
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##### Goats (Continued)

09.4.11 Improve methods to prevent or control diseases,  
particularly respiratory diseases, enteritis,  
and mastitis.

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09.4.12 Study the genetic traits affecting meat production  
by goats in the U.S. and elsewhere in the world.

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## 10.1 DAIRY

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### OBJECTIVE:

To produce the quality and quantity of milk and milk products required to help meet human food demands, with maximum efficiency in the use of land, animal and feed resources, while maintaining environmental quality, reasonable profit margins, and retail prices that are compatible with consumer incomes.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Production

Enter Rating  
Here

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- 10.1.01 Develop feeding systems to increase voluntary intake of forage and to make use of both forage and food processing byproducts. \_\_\_\_\_
- 10.1.02 Increase digestibility of materials such as straw and other crop residues, or byproducts. \_\_\_\_\_
- 10.1.03 Determine the nutrient requirements of high-producing dairy cows. \_\_\_\_\_
- 10.1.04 Improve methods for identifying superior bulls. \_\_\_\_\_
- 10.1.05 Improve methods for identifying superior cows. \_\_\_\_\_
- 10.1.06 Develop methods for identifying animals with high genetic potential at an early age. \_\_\_\_\_
- 10.1.07 Develop methods to identify breeding animals that will perform efficiently on high-forage diets. \_\_\_\_\_
- 10.1.08 Improve calf and young stock management systems for development of replacement animals. \_\_\_\_\_
- 10.1.09 Develop feeding systems to achieve optimum milk production in relation to costs. \_\_\_\_\_

### Disease Control

- 10.1.10 Develop better ways to prevent, treat and control mastitis. \_\_\_\_\_

## 10.1 DAIRY

(Continued)

Enter Rating  
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### Disease Control (Continued)

- 10.1.11 Develop better immunizing and management methods to prevent and control calf scours and other enteric diseases. \_\_\_\_\_
- 10.1.12 Develop better methods to prevent and control reproductive diseases such as vibriosis, leptospirosis and brucellosis. \_\_\_\_\_
- 10.1.13 Increase efforts to prevent and control foot-and-mouth disease and other foreign animal diseases that threaten U.S. cattle populations. \_\_\_\_\_
- 10.1.14 Develop better ways to prevent toxicosis and toxic residues in dairy products and meat. \_\_\_\_\_

### Processing and Marketing

- 10.1.15 Improve methods, including packaging and storage methods, for cheese and certain other dairy products in order to meet international competition. \_\_\_\_\_
- 10.1.16 Improve economic and physical efficiency in various phases of assembly, processing, distributing, merchandising and pricing milk and dairy products. \_\_\_\_\_
- 10.1.17 Improve methods to reduce spoilage or loss of quality in dairy products. \_\_\_\_\_

### Consumer Needs and Environmental Quality

- 10.1.18 Develop reliable, rapid and practical ways to detect undesirable residues and evaluate their significance to health. \_\_\_\_\_
- 10.1.19 Develop a wider selection of dairy products to meet special dietary needs, such as low-sodium milk, low-lactose milk and milk products, low-calorie frozen desserts, and low-cholesterol and low-fat products. \_\_\_\_\_
- 10.1.20 Develop more efficient ways to convert farm and processing wastes into usable products; also determine how much waste can go onto the soil without affecting crop yield or quality, or groundwater. \_\_\_\_\_

## 10.2 POULTRY

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### OBJECTIVE:

To achieve the highest production and marketing efficiency for wholesome eggs and poultry meat consistent with best use of resources and minimum pollution of the environment.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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### Production

- 10.2.01 Improve the rate of lay, particularly in turkey and meat-type chickens; also increase the length of laying periods and decrease the intervals between them. \_\_\_\_\_
- 10.2.02 Determine the most effective balance of dietary and environmental energy consistent with best feed utilization and resource conservation. \_\_\_\_\_
- 10.2.03 Develop and evaluate alternate sources of feed which do not compete with human food requirements. \_\_\_\_\_
- 10.2.04 Determine the best conditions, including reduced stress and disease, to attain most efficiency of feed use. \_\_\_\_\_
- 10.2.05 Improve structures to give best control of light, temperature and humidity for high productivity and efficient use of resources. \_\_\_\_\_

### Disease Control

- 10.2.06 Determine best methods of recycling poultry wastes, including handling methods and identification of heavy metals and other residues. \_\_\_\_\_
- 10.2.07 Improve methods to detect latent infections and carriers of viscerotropic velogenic Newcastle disease. \_\_\_\_\_



## 10.2 POULTRY

(Continued)

Enter Rating  
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### Disease Control (Continued)

- 10.2.08 Develop better control or eradication methods for Marek's disease and lymphoid leukosis. \_\_\_\_\_
- 10.2.09 Develop vaccines and ways to use them to eradicate Newcastle disease. \_\_\_\_\_
- 10.2.10 Study mycotoxicosis and its effects; develop methods to detect toxins and prevent or treat their effects. \_\_\_\_\_
- 10.2.11 Improve methods to detect and eradicate pathogenic Mycoplasma species from all poultry. \_\_\_\_\_

### Processing and Marketing

- 10.2.12 Investigate ways to reduce skin diseases and blemishes and improve bone strength in broilers to prevent downgrading in processing. \_\_\_\_\_
- 10.2.13 Improve eggshell strength and texture, especially after 9 months of lay. \_\_\_\_\_
- 10.2.14 Develop new, nutritious and wholesome products from poultry meat, eggs and byproducts with improved consumer acceptance. \_\_\_\_\_
- 10.2.15 Develop methods for most effective use of byproducts from slaughter, and of wastes from hatcheries and processing plants. \_\_\_\_\_

### Consumer Needs and the Environment

- 10.2.16 Prevent potentially harmful residues in poultry products. \_\_\_\_\_
- 10.2.17 Develop a faster test for Salmonella; also develop methods to eliminate organisms like Salmonella in food products without affecting nutrition or quality ("pasteurization" of egg products). \_\_\_\_\_
- 10.2.18 Design monitoring programs to detect pesticides and heavy metals in poultry meat and eggs, and to help determine the source and chain of transmission. \_\_\_\_\_

10.2 POULTRY

(Continued)

Enter Rating  
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Consumer Needs and the Environment (Continued)

10.2.19 Determine whether mycotoxins can be transmitted  
through poultry into meat or eggs.

\_\_\_\_\_

10.2.20 Reduce bacterial and other contamination throughout  
the marketing chain in order to improve whole-  
someness and reduce waste.

\_\_\_\_\_





### 10.3 AQUATIC FOODS

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#### OBJECTIVE:

To increase the quantity, quality and diversity of aquatic foods to meet requirements for human foods with nutritional and economic advantages and with ecological efficiency in utilizing freshwater and marine resources.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
Here

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#### Resource Appraisal

- 10.3.01 Measure the abundance and distribution of aquatic food resources during their early life stages. \_\_\_\_\_
- 10.3.02 Measure abundance and distribution of harvestable groundfish and shellfish that live at or near the bottom (flounders, shrimp, etc.). \_\_\_\_\_
- 10.3.03 Measure abundance and distribution of species which live off the bottom (salmon, menhaden, etc.). \_\_\_\_\_
- 10.3.04 Use data collected from commercial and recreational fisheries and scientific surveys to evaluate and predict the condition of fisheries resources. \_\_\_\_\_

#### Marine Harvesting

- 10.3.05 Develop techniques to scientifically manage harvesting, in order to maintain or restore aquatic food resources. \_\_\_\_\_

#### Aquaculture

- 10.3.06 Close gaps in knowledge of key aquaculture species-- spawning, larval rearing, environmental requirements, etc. \_\_\_\_\_
- 10.3.07 Determine nutritional requirements of cultured species and develop economic feeds. \_\_\_\_\_

### 10.3 AQUATIC FOODS

(Continued)

Enter Rating  
Here

#### Aquaculture (Continued)

- 10.3.08 Develop methods to recognize, prevent and treat diseases. \_\_\_\_\_
- 10.3.09 Develop desired characteristics in cultured aquatic animals through selective breeding and genetic modification. \_\_\_\_\_
- 10.3.10 Develop economical and effective methods of culture, harvesting, pollution control, etc. \_\_\_\_\_
- 10.3.11 Design and develop methods for the culture of fish and shellfish in closed systems. \_\_\_\_\_

#### Processing and Marketing

- 10.3.12 Develop more efficient processing methods to make possible a net increase in yields from aquatic resources. \_\_\_\_\_
- 10.3.13 Improve processing, handling and storage methods to reduce deterioration. \_\_\_\_\_
- 10.3.14 Improve recovery of fish protein through better and more efficient processing. \_\_\_\_\_
- 10.3.15 Develop information that will reduce economic losses due to unstable supply and demand. \_\_\_\_\_
- 10.3.16 Locate points in the marketing chain where spoilage most often occurs, and find ways to prevent it. \_\_\_\_\_

#### Consumer Needs

- 10.3.17 Develop processing, handling and storage methods to prevent health hazards from microorganisms. \_\_\_\_\_
- 10.3.18 Develop new products to expand the variety of seafoods available to the consumer. \_\_\_\_\_

#### Legal and Institutional Problems

- 10.3.19 Determine how existing institutional and legal constraints affect the supply and use of aquatic foods. \_\_\_\_\_

## 11.1 HUMAN RESOURCES

### OBJECTIVE:

To utilize fully human resource potentials, and to improve them to the fullest extent possible consistent with meaningful labor force participation and productivity in agricultural industries.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

		Enter Rating Here
<u>Agricultural Labor</u>		
11.1.01	Describe the composition of the agricultural work force, on farms and off.	_____
11.1.02	Determine adequate wage and work incentives for farm workers.	_____
11.1.03	Analyze the wage differences between agricultural and non-agricultural workers.	_____
11.1.04	Develop labor management models for agricultural settings.	_____
11.1.05	Investigate and propose solutions to collective bargaining problems which are characteristic of agriculture.	_____
11.1.06	Evaluate future supply and demand for human employment in agriculture, on farms and off.	_____
<u>Small Farmers</u>		
11.1.07	Determine the impact of economic and technological change on small farmers.	_____
11.1.08	Develop technologies specifically designed for use on small farms.	_____
11.1.09	Determine ways to increase productivity of currently marginal farmers.	_____

## 11.2 SOCIAL INSTITUTIONS

(Continued)

Enter Rating  
Here

### Local Government (Continued)

- 11.2.08 Develop techniques to aid local rural governments to do a better job of analyzing alternative solutions to their problems. \_\_\_\_\_
- 11.2.09 Evaluate alternative sources of revenue for rural local governments. \_\_\_\_\_

### Facilities and Services in Rural Areas

- 11.2.10 Develop ways to measure adequacy of governmental and non-governmental services in rural areas. \_\_\_\_\_
- 11.2.11 Analyze effects on the quality of rural life of cultural, educational and health facilities, and communication, transportation and other services; evaluate alternate ways of improving them. \_\_\_\_\_
- 11.2.12 Evaluate the cost and feasibility of alternative ways to provide services to low density areas. \_\_\_\_\_
- 11.2.13 Determine demands for alternative services in low density areas. \_\_\_\_\_

### Research

- 11.2.14 Research on how best to conduct and organize agricultural research. \_\_\_\_\_

## 12.0 MARKETING SYSTEMS

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### OBJECTIVE:

To identify and find solutions to problems that impede the efficient performance of the marketing system in (1) providing the storage, transport, processing and distribution services needed to make food available to consumers at the lowest possible cost; (2) reflecting consumer needs and preferences, and (3) properly allocating resources and returns in production and marketing.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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Enter Rating  
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### Costs

- 12.0.01 Evaluate costs and profits of alternative organizational systems, scale of operation, handling methods, and level of technology. \_\_\_\_\_
- 12.0.02 Examine the impacts of labor practices and agreements on costs. \_\_\_\_\_
- 12.0.03 Examine the impacts of transportation regulations on costs. \_\_\_\_\_
- 12.0.04 Examine the cost impacts of health and labeling requirements and other governmental regulations. \_\_\_\_\_

### Productivity

- 12.0.05 Identify technological improvements and new organizational forms. \_\_\_\_\_
- 12.0.06 Evaluate alternative ways to reduce the use of energy, in order to minimize effects of energy costs and shortages on the marketing system. \_\_\_\_\_
- 12.0.07 Analyze measures at the farm level by function; e.g., capital, labor use, and volume movement that may affect productivity. \_\_\_\_\_

## 12.0 MARKETING SYSTEMS

(Continued)

Enter Rating  
Here

### Structure, Conduct and Performance

- 12.0.08 Develop input-output data for various segments of industry and types of business. \_\_\_\_\_
- 12.0.09 Develop norms for public surveillance and guidance in the areas of food safety, food advertising, and consumer information. \_\_\_\_\_
- 12.0.10 Identify and analyze price policies and exchange arrangements among groups of market participants. \_\_\_\_\_
- 12.0.11 Develop information for consumers about the composition of retail prices. \_\_\_\_\_

### Transportation and Storage

- 12.0.12 Evaluate storage and transportation losses and costs for fresh, canned, frozen, and dehydrated foods. \_\_\_\_\_
- 12.0.13 Determine quality losses or waste associated with types of storage. \_\_\_\_\_
- 12.0.14 Compare costs of (1) scheduled transport flows and (2) variable flows in accordance with varying production and demand requirements. \_\_\_\_\_
- 12.0.15 Evaluate future storage and transportation needs. \_\_\_\_\_
- 12.0.16 Examine methods and procedures for reducing transportation costs. \_\_\_\_\_

### Spoilage and Loss of Quality

- 12.0.17 Measure spoilage waste in the forms of lost product, lost value and reduced quality throughout the food marketing systems. \_\_\_\_\_

## 12.0 MARKETING SYSTEMS

(Continued)

Enter Rating  
Here

### Spoilage and Loss of Quality (Continued)

12.0.18 Determine costs and benefits of reducing  
or controlling losses.

\_\_\_\_\_

12.0.19 Determine costs and benefits of food  
sanitation and quality control  
programs.

\_\_\_\_\_

### Consumer Needs

12.0.20 Determine what marketing services are  
available to low income consumers and  
what kind of services they need; evaluate  
costs and benefits of food stamps, and  
alternatives that deliver more nutrition  
and less marketing services.

\_\_\_\_\_





## 13.1 PRODUCTION INPUTS AND SERVICES

### OBJECTIVE:

To assure an adequate and stable supply of production resources.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

<u>Current Conditions</u>		<u>Enter Rating Here</u>
13.1.01	Analyze and describe the fertilizer industry, including structure and cost data.	_____
13.1.02	Analyze and describe the pesticide industry, including structure and cost data.	_____
13.1.03	Analyze and describe the farm machinery industry, including structure and cost data.	_____
13.1.04	Develop price indexes for agricultural chemicals and fertilizers.	_____
13.1.05	Develop more detailed price indexes for farm machinery and motor vehicles.	_____
13.1.06	Obtain yearly fertilizer and pesticide use data.	_____
13.1.07	Obtain more frequent and more accurate data on supply or availability of fertilizer and pesticides.	_____
<u>Supply and Demand</u>		
13.1.08	Develop and improved supply data system.	_____
13.1.09	Investigate the supply of various agricultural inputs.	_____
13.1.10	Develop demand estimates for agricultural chemicals.	_____
13.1.11	Develop demand estimates for major types of farm equipment.	_____

### 13.1 PRODUCTION INPUTS AND SERVICES

(Continued)

<u>Supply and Demand (Continued)</u>		Enter Rating Here
13.1.12	Develop demand estimates for other inputs and services.	_____
13.1.13	Determine the contribution of various inputs to agricultural productivity.	_____
13.1.14	Evaluate the input requirements of new technologies such as integrated pest management, nitrogen fixation, etc.	_____
13.1.15	Evaluate alternative methods of organizing input systems and agricultural production.	_____
13.1.16	Evaluate alternative systems for supplying farm machinery, and identify barriers, if any, that limit their performance.	_____
<u>Policies</u>		
13.1.17	Evaluate alternative public policies on farm machinery supply.	_____
13.1.18	Evaluate alternative public policies on supply and adequacy of agricultural chemicals.	_____
13.1.19	Evaluate alternative public policies on supply and adequacy of energy.	_____

## 13.2 PRODUCTION SYSTEMS

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### OBJECTIVE:

To effectively utilize available resources for food production.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

---

### Organization

Enter Rating  
Here

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13.2.01 Determine the impact of taxes (income, inheritance, property, etc.) on production efficiency via changes in tenure arrangements, size of farming units, and choice of enterprises. \_\_\_\_\_

13.2.02 Describe the organization of agriculture, with specific attention to viable full-time commercial units. \_\_\_\_\_

### Management

13.2.03 Develop management strategies to help producers cope with increased price uncertainty. \_\_\_\_\_

13.2.04 Study management capabilities of farmers in relation to size of unit. \_\_\_\_\_

13.2.05 Develop management strategies that are effective on small farms. \_\_\_\_\_

### Resources

13.2.06 Estimate effects on crop and livestock production of changes in availabilities and prices of resources. \_\_\_\_\_

13.2.07 Investigate the substitution of various forages for grain in order to produce beef of varying qualities. \_\_\_\_\_

## 13.1 PRODUCTION INPUTS AND SERVICES

(Continued)

<u>Supply and Demand (Continued)</u>		<u>Enter Rating Here</u>
13.1.12	Develop demand estimates for other inputs and services.	_____
13.1.13	Determine the contribution of various inputs to agricultural productivity.	_____
13.1.14	Evaluate the input requirements of new technologies such as integrated pest management, nitrogen fixation, etc.	_____
13.1.15	Evaluate alternative methods of organizing input systems and agricultural production.	_____
13.1.16	Evaluate alternative systems for supplying farm machinery, and identify barriers, if any, that limit their performance.	_____
<u>Policies</u>		
13.1.17	Evaluate alternative public policies on farm machinery supply.	_____
13.1.18	Evaluate alternative public policies on supply and adequacy of agricultural chemicals.	_____
13.1.19	Evaluate alternative public policies on supply and adequacy of energy.	_____

## 13.2 PRODUCTION SYSTEMS

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### OBJECTIVE:

To effectively utilize available resources for food production.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Organization

Enter Rating  
Here

---

13.2.01 Determine the impact of taxes (income, inheritance, property, etc.) on production efficiency via changes in tenure arrangements, size of farming units, and choice of enterprises.

13.2.02 Describe the organization of agriculture, with specific attention to viable full-time commercial units.

### Management

13.2.03 Develop management strategies to help producers cope with increased price uncertainty.

13.2.04 Study management capabilities of farmers in relation to size of unit.

13.2.05 Develop management strategies that are effective on small farms.

### Resources

13.2.06 Estimate effects on crop and livestock production of changes in availabilities and prices of resources.

13.2.07 Investigate the substitution of various forages for grain in order to produce beef of varying qualities.

## 13.2 PRODUCTION SYSTEMS

(Continued)

<u>Resources (Continued)</u>	<u>Enter Rating Here</u>
13.2.08 Investigate alternative double-crop management systems, such as wheat-soybeans.	<hr/>
13.2.09 Analyze potential national, state and local yield variations due to weather, and publish estimates for each crop.	<hr/>
<u>Costs and Return</u>	
13.2.10 Develop and maintain farm enterprise budget data systems for farms in major US farming regions.	<hr/>
13.2.11 Establish basic budget data and ways of adapting them to individual farms early enough in the season to use in production planning.	<hr/>
13.2.12 Compare costs and returns for specialized farming systems with those that can shift quickly from one product mix to another.	<hr/>
13.2.13 Identify cost differences between the most and least efficient farm units, by crop or type of livestock.	<hr/>
13.2.14 Develop better ways to measure price elasticities, and to identify the conditions where they apply.	<hr/>
13.2.15 Update price and income elasticities.	<hr/>
13.2.16 Prepare better estimates of domestic and foreign demand before farm production plans are made, with special attention to demand for short crops.	<hr/>
<u>New Technology</u>	
13.2.17 Identify potential new technological developments, and evaluate their impacts.	<hr/>
13.2.18 Analyze the effect of new technology on the size of operation needed to produce efficiently.	<hr/>
13.2.19 Evaluate the on-farm and off-farm impact of alternative technologies early in their development, in order to guide allocation of funds for further development.	<hr/>

## 13.2 PRODUCTION SYSTEMS

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(Continued)

Enter Rating  
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### New Technology (Continued)

- 13.2.20 Evaluate the potential effects of various prices on the profitability of technologies that are available but not used.
-





## 14.1 PUBLIC POLICY: DOMESTIC

### OBJECTIVE:

To enable society to decide on public policies that will provide adequate supplies of food and reasonable prices for domestic and foreign markets, with due regard for conservation, environmental quality and efficient use of natural resources.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

Enter Rating  
Here

### Government Programs and Policies

- 14.1.01 Evaluate the potential of intermediate and long-run governmental assurances on prices and incomes, as a means of stimulating agricultural output. \_\_\_\_\_
- 14.1.02 Estimate the costs of commodity programs in relation to costs of food. \_\_\_\_\_
- 14.1.03 Evaluate alternative means of managing crop supplies, such as management of inputs or production factors other than land. \_\_\_\_\_
- 14.1.04 Investigate the implications of, and means of improving, existing farm legislation. \_\_\_\_\_
- 14.1.05 Find ways to encourage more food production by small farmers, part-time farmers, and underemployed rural people. \_\_\_\_\_
- 14.1.06 Determine effects of alternate methods of taxation on food production, including land taxes. \_\_\_\_\_

### Public Information

- 14.1.07 Estimate the requirements for grains in disaster-prone areas, and its potential impact on U.S. food production. \_\_\_\_\_
- 14.1.08 Develop information on ways to participate in the formulation of public policy for the food system. \_\_\_\_\_

## 14.1 PUBLIC POLICY: DOMESTIC

(Continued)

<u>Food Assistance</u>		Enter Rating Here
14.1.09	Determine costs and benefits of alternative ways of administering the food stamp program.	_____
14.1.10	Analyze and compare the effects of (1) assistance restricted to certain categories of consumers through food stamps and direct food distribution and (2) an income assistance program without such restrictions.	_____
<u>Reserves</u>		
14.1.11	Determine the effects of alternate levels of reserve food stocks, including no stocks at all, on market prices over time.	_____
14.1.12	Evaluate the consequences to farmers, consumers and taxpayers of alternative policies for acquiring and releasing stocks.	_____
14.1.13	Evaluate the consequences to farmers, consumers and taxpayers of alternative means of ownership and control of stocks.	_____
14.1.14	Estimate the costs of alternative reserve programs.	_____
<u>Consumer Needs and the Environment</u>		
14.1.15	Evaluate the nutritional impact of alternative food assistance programs on recipients.	_____
14.1.16	Evaluate food policy implications of recent shifts in consumer demands.	_____
14.1.17	Develop information on the total agricultural industry needed for public monitoring of crucial supply, demand, and trade variables.	_____

## 14.2 PUBLIC POLICY: INTERNATIONAL

### OBJECTIVE:

### IMPORTANCE RATINGS

To support the decision-making process by the public and the U.S. government by assessing effects of alternative policies of various nations on prices, farm income support, resource allocation, trade, exports, food aid, technical assistance, reserves, etc.-- including the effects of interacting policies in a world environment.

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

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### Trade and Monetary Policy

Enter Rating  
Here

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- 14.2.01 Evaluate the effects of exporting countries' agricultural trade policies on the demand for U.S. farm products. \_\_\_\_\_
- 14.2.02 Evaluate impacts of varying rates of general worldwide inflation on farm product markets. \_\_\_\_\_
- 14.2.03 Investigate the probable consequences of further liberalization of trade on U.S. agriculture. \_\_\_\_\_
- 14.2.04 Evaluate alternative policies to promote agricultural exports. \_\_\_\_\_
- 14.2.05 Evaluate the impact on the developing countries' agricultural trade of the preference system authorized by the Trade Act of 1974. \_\_\_\_\_
- 14.2.06 Analyze international commodity marketing agreements as one approach to food and agricultural policy. \_\_\_\_\_
- 14.2.07 Analyze effects of importing countries' agricultural trade policies on the demand for U.S. farm products. \_\_\_\_\_

## 14.2 PUBLIC POLICY: INTERNATIONAL

(Continued)

		Enter Rating Here
<u>Foreign Assistance</u>		
14.2.08	Determine the technical and financial assistance required by developing countries most severely affected by high energy and fertilizer prices.	_____
14.2.09	Evaluate the effects on employment and income distribution of assistance to increase food production.	_____
14.2.10	Estimate the impact of foreign food aid on domestic food prices.	_____
<u>Reserves</u>		
14.2.11	Evaluate alternative world food reserve policies designed to achieve varying degrees of price and supply stability.	_____
14.2.12	Analyze the relation between food reserve systems, stabilization of the world monetary supply, and price levels.	_____
14.2.13	Determine the probability of world surplus or deficiency in capacity to supply food and feed grains.	_____
<u>Policies of Foreign Governments</u>		
14.2.14	Measure the impact of non-tariff trade barriers applied by foreign countries against agricultural imports.	_____
14.2.15	Evaluate state trading in world food markets, including benefits and costs of export commodity boards for selected agricultural commodities.	_____
14.2.16	Assess the effects of Soviet and Eastern European grain importing policies on world supply and price stability.	_____
14.2.17	Monitor and project changes in world demand and supply in response to foreign exchange rates and other international financial factors.	_____

14.2 PUBLIC POLICY: INTERNATIONAL  
(Continued)

Enter Rating  
Here

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Climate and Policy

- 14.2.18 Identify and evaluate current trends in environmental factors that determine world food production, such as climate and weather.
- 14.2.19 Determine the probabilities of drought, flood or other natural disasters in various regions of the world, in order to prepare contingency aid plans.

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Public Policy

- 14.2.20 Assess the economic consequences of public investment in agricultural research and technology; determine the implications for future public policy under alternative sector situations.

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### 14.3 FINANCE

#### OBJECTIVE:

To reduce the cost of financial management in production and marketing; to lower the financial barriers to economic opportunity in production and marketing; and to increase the equality of access to financial markets.

#### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

<u>Data Systems</u>		<u>Enter Rating Here</u>
14.3.01	Provide information about sources and flows of equity capital into and out of agriculture.	_____
14.3.02	Provide information about flows of long, intermediate and short-term loans from individuals, merchants and dealers.	_____
14.3.03	Estimate gross and net flows of funds into agriculture.	_____
14.3.04	Develop procedures for monitoring interest rates, by types of lenders.	_____
<u>Financial Markets</u>		
14.3.05	Evaluate the impact that innovations in securing capital funds (incorporation, integration, contracting, leasing, etc.) may have on farm ownership and debt patterns.	_____
14.3.06	Identify and evaluate the barriers that affect entry and exit from the agricultural sector by new and older individuals, and the implications for ownership and use of major resources.	_____
14.3.07	Monitor the economic and financial environment in which agricultural decision-makers operate.	_____



### 14.3 FINANCE

(Continued)

#### Financial Markets - (Continued)

Enter Rating  
Here

- 14.3.08 Investigate the relationships between commodity markets and financial markets, including agricultural terms of trade and the evolution of techniques for managing commodity exchange.
- 14.3.09 Evaluate the implications of government subsidization of agricultural credit, such as FHA, REA and the credit phases of CCC.
- 14.3.10 Evaluate the impacts of government agencies that monitor and regulate private credit institutions serving agriculture--the FCA, commercial banks, etc.
- 14.3.11 Develop alternatives by which credit management assistance could be provided to agricultural firms and cooperatives.

#### Demand and Supply

- 14.3.12 Identify the factors that encourage or discourage flows of capital into the agricultural sector.
- 14.3.13 Measure the rate of return by various categories, such as size of farm or type of farm.
- 14.3.14 Identify factors that contribute to misallocation of equity or debt capital.
- 14.3.15 Determine the relationship between sources of funds and uses of funds; how cash flows of capital are financed; factors that affect the substitution of current income for loans; and other factors that influence demand and supply of capital.
- 14.3.16 Investigate the linkage between financial markets serving agriculture and those which serve other local or national users of money.

14.3 FINANCE

(Continued)

Demand and Supply (Continued)

Enter Rating  
Here

- |         |  |       |
|---------|--|-------|
| 14.3.17 | Evaluate the availability of capital to meet economically feasible requests for productive purposes that otherwise would be impossible to meet through a farm unit's own means.              | _____ |
| 14.3.18 | Assess aggregate short and intermediate adjustments in farm capital that are required in periods of price and cost uncertainty, as recently experienced in the cotton and livestock sectors. | _____ |



/

15.1 INTERNATIONAL DEVELOPMENT:  
FOOD PRODUCTION TECHNOLOGIES AND RESOURCE MANAGEMENT

OBJECTIVE:

To increase production of food and improve resource management capabilities in developing countries.

IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

	Enter Rating Here
15.1.01 Develop high yielding varieties of cereals (including wheat, maize, rice, sorghum, millet and barley) with improved level and quantity of stability over a wide range of environmental conditions including resistance to insect pests, diseases and unfavorable soil conditions.	_____
15.1.02 Develop high yielding varieties of important food legumes (including dry beans, soybeans, cowpeas, pigeon peas, chick peas, peanuts, lentils and broadbeans) with high level of genetic resistance to insect and disease problems giving particular attention to some of the basic physiological and morphological constraints that limit yield of this group of food crops (including indeterminate flowering, rate of flower drop and photosynthetic efficiency), and attention to soybeans varieties in the tropics and subtropics.	_____
15.1.03 Develop high yielding varieties of important starch food staples (including potatoes, sweet potatoes, cassava and yams) with attention to nutritional quality and disease and insect resistance.	_____
15.1.04 Develop improved soil and water management technology, particularly in relation to food production in the developing countries of the tropics.	_____

15.1 INTERNATIONAL DEVELOPMENT:  
FOOD PRODUCTION TECHNOLOGIES AND RESOURCE MANAGEMENT  
 (continued)

	<u>Enter Rating Here</u>
15.1.05 Collect information on seasonal evaporation rates (averages and probabilities) and on rainfall patterns for use in planning water management and cropping cycles.	_____
15.1.06 Appraise the physical, chemical and biological properties of soils.	_____
15.1.07 Develop methods of soil conservation appropriate to the tropics.	_____
15.1.08 Conduct long-term evaluations of the effect of land use on stream flow in catchment areas.	_____
15.1.09 Develop alternative or improved technologies for supply of plant nutrients including more effective and broad-based biological fixation of nitrogen and more appropriate chemical fertilizer technology for the soils and climate of the tropics.	_____
15.1.10 Develop low cost, low risk inputs and integrated methods of crop protection against insect pests and diseases.	_____
15.1.11 Develop improved ruminant livestock production systems by improving production of feed including range management, control of important diseases, and identification and evaluation of socio-economic constraints to increase production of livestock.	_____
15.1.12 Investigate the use of power in tropical agriculture.	_____
15.1.13 Develop appropriate mechanization technology for food production in the developing countries.	_____
15.1.14 Develop improved farming systems with emphasis on the small farmer which may include a series of crops along with livestock.	_____
15.1.15 Develop improved technology for production of aquatic sources of food.	_____

15.2 INTERNATIONAL DEVELOPMENT:  
FOOD QUALITY AND DISTRIBUTION

OBJECTIVE:

IMPORTANCE RATINGS

To improve the quality of food to ensure adequate nutrition and to improve the means of food distribution in developing countries.

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

Nutrition

Enter Rating  
Here

- 15.2.01 Determine standards for what constitutes a balanced diet in developing regions and countries taking into account protein, energy, vitamins, mineral element and protein requirement. \_\_\_\_\_
- 15.2.02 Appraise health problems resulting from mal-nutrition and devise strategies to overcome them. \_\_\_\_\_
- 15.2.03 Determine the biological availabilities of nutrients in major staple foods of developing countries and regions. \_\_\_\_\_
- 15.2.04 Provide a continuing source of research information and work in progress from public and private research organizations to developing country research organizations and relevant government agencies. \_\_\_\_\_
- 15.2.05 Develop information on the consumption patterns of both rural and urban households. \_\_\_\_\_
- 15.2.06 Make U.S. personnel and techniques for conducting nutrition surveys available through appropriate institutional linkages. \_\_\_\_\_
- 15.2.07 Evaluate the importance of social attitudes on the use and consumption of nontraditional food commodities, e.g., vegetables in the diets of subsistence cereals producers. \_\_\_\_\_
- 15.2.08 Evaluate and devise nutrition education programs that are appropriate to varying family systems and cultural groups. \_\_\_\_\_

15.2 INTERNATIONAL DEVELOPMENT  
FOOD QUALITY AND DISTRIBUTION  
(Continued)

Enter Rating  
Here

Food Distribution

- |         |   |       |
|---------|---|-------|
| 15.2.09 | Devise low-cost techniques for farm or village storage.   | _____ |
| 15.2.10 | Develop low-cost systems for rainy season harvesting to minimize losses and preserve quality.                     | _____ |
| 15.2.11 | Conduct studies of the income-consumption patterns of both rural and urban households.                            | _____ |
| 15.2.12 | Assess losses and waste of food incurred in harvesting, marketing, and household preparation.                     | _____ |
| 15.2.13 | Develop storage and distribution systems, for non-traditional, more nutritious foods.                             | _____ |
| 15.2.14 | Develop methods for motivating people in developing countries to use improved new foods or preparation processes. | _____ |
| 15.2.15 | Develop standards and grades for major crop and livestock products.   | _____ |
| 15.2.16 | Determine methods to enhance or protect food quality from farm to consumer.                                       | _____ |
| 15.2.17 | Determine storage conditions for perishable foods in tropical climates.   | _____ |



15.3 INTERNATIONAL DEVELOPMENT:  
ECONOMIC, POLITICAL, AND INTERNATIONAL ASPECTS OF TECHNOLOGY AND RESEARCH

OBJECTIVE:

To develop economic, political and institutional arrangements that will contribute to increasing and improving food supplies in developing countries and facilitate the organization of research resources and transfer of technology.

IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

Enter Rating  
Here

Income and Equity

- 15.3.01 Assess distribution problems of reaching low income groups in developing countries, e.g., landless laborers in the rural areas or new migrants to urban areas.

- 15.3.02 Analyze the employment impacts of output increasing technologies.

Agricultural Policies

- 15.3.03 Analyze price policies for agricultural inputs and outputs and relate these to general economic policies.

- 15.3.04 Analyze the impact of incentive producer prices on the cost of food to urban consumers.

- 15.3.05 Develop data for the study of consumption patterns of both rural and urban households.

- 15.3.06 Develop price elasticities for major agricultural products.

- 15.3.07 Analyze the profitability of "recommended" inputs and practices and investigate other promising ones under farm conditions, giving attention to constraints that limit improved yields.

- 15.3.08 Develop approaches to predicting the effect of policy decisions on production and consumption.



15.3 INTERNATIONAL DEVELOPMENT:  
ECONOMIC, POLITICAL, AND INTERNATIONAL ASPECTS OF TECHNOLOGY AND RESEARCH  
(Continued)

Agricultural Policies (continued)

Enter Rating  
Here

15.3.09 Investigate and publish price information, especially producer prices, where this is not available.

\_\_\_\_\_

15.3.10 Assess policies affecting the supply and distribution of farm inputs.

\_\_\_\_\_

Trade and Commodities

15.3.11 Evaluate the impact of monetary and trade policies, e.g., overvaluation of foreign exchange rates, export tariffs, or output, employment and income in agriculture.

\_\_\_\_\_

15.3.12 Assess the benefits and costs of importing versus domestically producing farm inputs, such as fertilizer, machinery and food.

\_\_\_\_\_

15.3.13 Assess the impact of international commodity agreements on production, consumption and trade of the developing countries.

\_\_\_\_\_

Organization of Research

15.3.14 Establish criteria for the utilization of scarce U.S. research resources in developing countries, developed countries, OPEC countries, and others.

\_\_\_\_\_

15.3.15 Develop an international research policy for the use of U.S. research capabilities in agriculture in the developing countries.

\_\_\_\_\_

15.3.16 Assess appropriate mechanisms to facilitate U.S. university involvement in agricultural research in developing countries.

\_\_\_\_\_

15.3.17 Continue support for and develop methods of expanding the outreach capabilities of the international research centers.

\_\_\_\_\_

15.3 INTERNATIONAL DEVELOPMENT  
ECONOMIC, POLITICAL, AND INTERNATIONAL ASPECTS OF TECHNOLOGY AND RESEARCH  
(Continued)

Organization of Research (continued)

Enter Rating  
Here  
\_\_\_\_\_

15.3.18      Strengthen national research institutions.

\_\_\_\_\_

15.3.19      Assess the research resources available and needed  
in developing countries.

\_\_\_\_\_



## 16.0 BASIC PROBLEMS OF PLANT GROWTH AND REPRODUCTION

### OBJECTIVE:

To improve the physical, biochemical and genetic processes in plants that presently limit photosynthetic rates, biosynthesis of ammonia, and genetic control of nutritional quality and yield.

### IMPORTANCE RATINGS

- A. Utmost importance
- B. Major importance
- C. Important
- D. Minor importance
- E. Very little importance
- N. No opinion

		<u>Enter Rating</u> <u>Here</u>
<u>Photosynthetic Efficiency</u>		
16.0.01	Determine ways to diminish wasteful respiration in food plants.	_____
16.0.02	Develop techniques to screen plants and plant cells for differences in rate of carbon dioxide fixation.	_____
16.0.03	Develop techniques to screen for superior photosynthetic efficiency in plants, cells, metabolic pathways and enzyme systems.	_____
16.0.04	Develop improved plant efficiency to assimilate, translocate and use products of photosynthesis.	_____
<u>Nitrogen Fixation</u>		
16.0.05	Develop more efficient symbiotic nitrogen fixing strains of bacteria, and reduce or eliminate the inhibition of the nitrogen-fixing enzyme of $\text{NH}_4$ .	_____
16.0.06	Increase the efficiency of crop plants in using nitrate.	_____
16.0.07	Develop nitrogen-fixing capacity in non-legume plants.	_____
16.0.08	Identify and develop improved strains of microorganisms capable of non-symbiotic (associative) nitrogen fixation.	_____

## 16.0 BASIC PROBLEMS OF PLANT GROWTH AND REPRODUCTION

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(Continued)

Enter Rating  
Here

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### Translocation and Accumulation Capacity

- 16.0.09 Determine the extent to which a plant's capacity to absorb, transport and accumulate nutrients restricts food production. \_\_\_\_\_
- 16.0.10 Determine how these plant capacities may be enhanced to produce more food. \_\_\_\_\_
- 16.0.11 Develop technology for increasing the absorption of plant nutrients. \_\_\_\_\_

### Environmental Stress

- 16.0.12 Study plant stress, devise principles to modify stress, look for genetic differences in stress tolerance and use them to develop stress tolerant varieties. \_\_\_\_\_

### Protein Synthesis

- 16.0.13 Analyze protein components of important grains and related wild species; determine amino acid sequences of proteins and their role; and determine mechanisms that control the pathways to protein synthesis. \_\_\_\_\_

### Gene Combination

- 16.0.14 Devise new methods and improve existing methods for combining desirable genes. \_\_\_\_\_
- 16.0.15 Devise methods to transfer genes among relatively unrelated types of plants. \_\_\_\_\_

### Seed Technology

- 16.0.16 Develop improved seed storage methods and technology to maximize viability and seedling vigor. \_\_\_\_\_
- 16.0.17 Determine the relationship of seed characteristics to ultimate crop production. \_\_\_\_\_

## 16.0 BASIC PROBLEMS OF PLANT GROWTH AND REPRODUCTION

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(Continued)

Enter Rating  
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### Herbicides and Plant Regulators

- 16.0.18 Develop pesticides and plant regulators that are  
both more effective and more environmentally safe.
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